Vol. XI. August, 1896. No. 2.

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MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS. STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

PUBLISHED BY
MUNICIPAL ENGINEERING COMPANY
INDIANAPOLIS NEW YORK

Two Dollars Per Year. Single Copies, 25 Cents.

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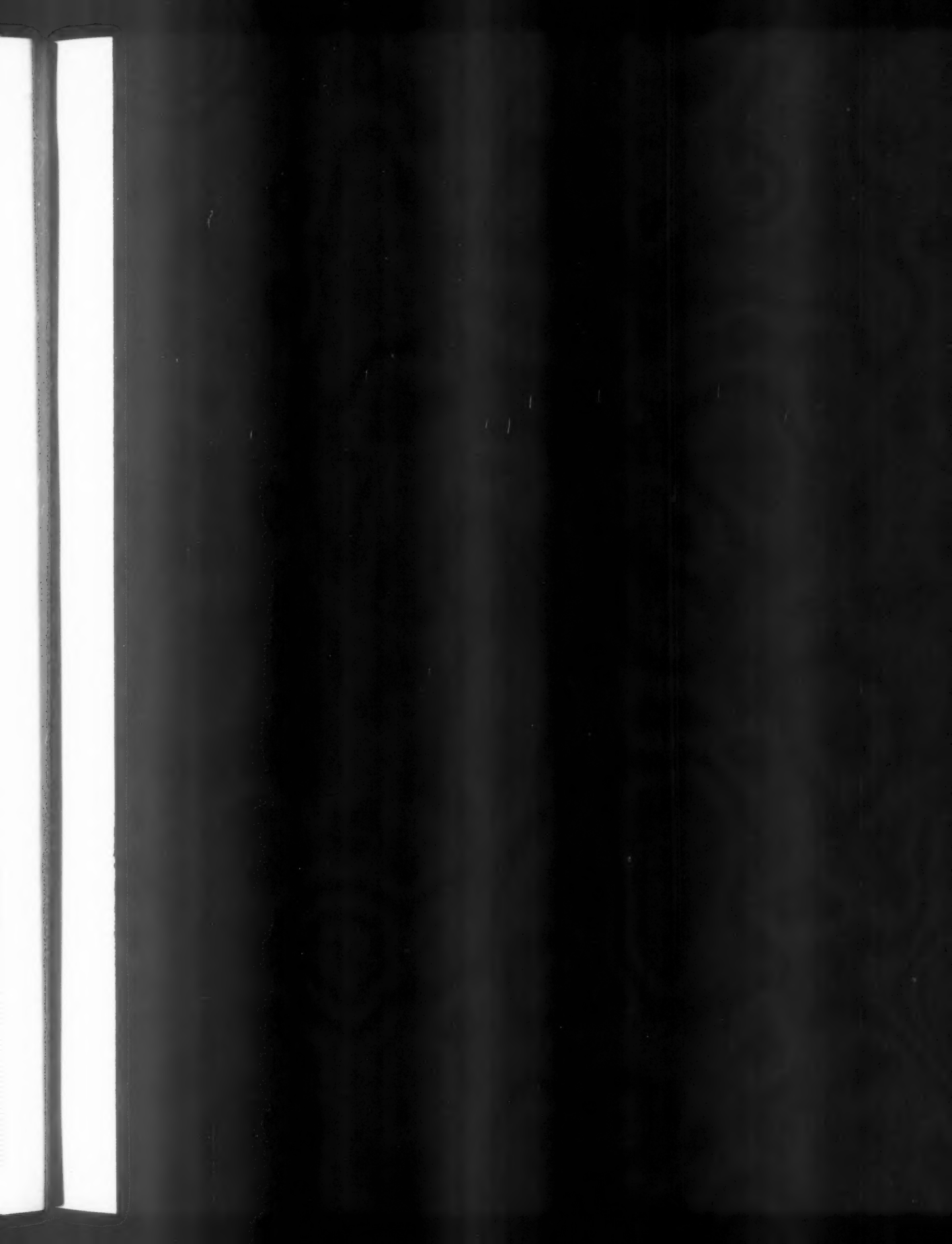

Municipal Engineering

VOLUME XI. AUGUST, EIGHTEEN NINETY-SIX. NUMBER 2.

THE CHEMICAL RELATIONS OF ASPHALTUM.

By Prof. S. F. Peckham.

IV.

In this paper I propose to show what has been done in the cities of Paris and London in the construction of streets of compressed natural asphalte and of asphalte mastic. For this purpose I shall make free use of a paper prepared in 1876 by M. Ernest Chabrier, translated by Mr. W. H. Delano, and published in the Proceedings of the London Institution of Civil Engineers. Mr. Delano is the general manager of the *Compagnie Général des Asphaltes de France*, which company lays the asphalte streets of Paris.

The application of rock asphalte to the construction of roads resulted from observing a fact of daily occurrence in asphalte mines. Lumps of asphaltic rock, when crushed by the wheels of the carts employed on the works, forms on frequented roads a crust of compressed asphalte. This property of asphalte of reintegrating itself into blocks by compression was proved by experiment to require a certain degree of heat. To effect this, the apparatus first employed was a decrepitator, of boiler plate, placed above a fire grate. The powder was spread over the plate, and frequently stirred. By this plan a careless workman might easily spoil a large portion of the material by overheating. To mitigate these evils an apparatus analagous to a large coffee roaster was designed, which worked by suitable gearing, was fed at one end and discharged from a trap near the other.

As asphalte cools very slowly and can therefore be allowed to remain for some time in an open cart, it is carted from the decrepitator to the street in one horse loads, which are spread by the workmen with rakes completely aross the street. The surface thus prepared is then rolled until thoroughly compacted and cold. Nothing can exceed the simplicity of this process.

If asphalte be heated to 212°–300° F. it loses its consistency and falls to powder. If the heating be increased the powder does not melt but the bitumen is evaporated leaving the limestone pure. If, however, at a temperature of 390°–480° F., a small portion of pure bitumen be added the asphalte melts. After melting it is no longer possible to reconstitute the asphalte and bitumen; moreover, if two pieces of asphalte be heated, one containing 5–6 per cent. of bitumen, the other 15 per cent. of bitumen, the latter will not melt alone, but if 7–8 per cent. of pure bitumen be added to the former, it will fuse and make a mastic though less rich in bitumen than the last, but it can not

be remelted without a fresh addition of bitumen, which thus appears to act as a flux.

Asphalte mastic is sent to places of consumption in blocks or cheeses, about 1 foot in diameter and 4 inches thick. Its employment for footpaths is considerable, usually mixed with sand. No chemical union takes place between the mastic and sand, but the cohesion is so complete that the fracture of sanded mastic will show the simultaneous fracture of the grit. The conditions necessary for the laying of the mastic are to prepare it with the least possible quantity of bitumen and to lay it as hot as practicable. For many years in Paris the mastic is prepared in large stationary boilers and delivered hot in portable boilers which can be heated and stirred during transport. It is evenly spread and rolled as in the case of the compressed asphalte.

In Lyons roadways of mastic have been quite extensively used, but in Paris they have given less satisfactory results.

In 1858 three sides of the Palais Royal, Paris, comprising an area of 3,600 square yards, were laid with compressed asphalte. The concrete was 5.9 inches thick and the asphalte was 2.4 inches thick in the Rue St. Honoré and the Rue de Richelieu and 2 inches thick in the Rue de Valois. Success was complete in spite of a bad season. The following year it was proposed that the Rue des Petits Champs should be paved in the same manner. This street had to be repaved for its entire length of more than 1,000 yards on account of a large drain in the construction of which the fine weather had been occupied. It was not until October that the roadway could be begun, and then on a soil newly filled at a depth of from 10 to 13 feet. The concrete laid was only 4 inches thick on which was placed 2 inches of asphalte. The work was carried on in November and December through rain and snow and the street was open for traffic on the 1st of January. Cracks immediately appeared and checked the further extension of asphalte roadways. The experiment in the Palais Royal, however, continued to be satisfactory, and as the same materials had been used, it became evident that the true causes of failure were the settling of the soil and the constant wet weather during the laying. Repairs were undertaken of each damaged part in succession, and at the return of fine weather they were completed. The engineer in charge declared this trial more satisfactory than the previous one, inasmuch as it proved that the material could be repaired extensively without stopping the traffic of the street.

About the year 1865, the engineers proposed to substitute compressed asphalte for granite sets to the extent of 100,000 square meters (24.7 acres). Here trials were first made with other rock than the Val de Travers. Seyssel rock was laid down on that part of the Rue de Richelieu comprised between the Boulevard and the Bourse, one of the busiest streets in Paris, and has answered perfectly. As regards the relative value of the only two asphaltic rocks used at present in laying compressed asphalte roadways, the Val de Travers limestone has not so close a grain, is softer and is more irregularly impregnated with bitumen than the Seyssel rock; but no engineer could conscientiously say that the Val de Travers is better than the Seyssel asphalte.

In a paper published in 1880 by Mr. Delano, also in the Proceedings of the Institution of Civil Engi-

neers,[1] he discusses at some length the proper foundation for an asphalte street.[2] He says, "the tradition is that sand is incompressible, that sand makes a good foundation for granite sets, and therefore, does equally well for concrete. Sand is incompressible in a cylinder, but under street traffic gets displaced, and absorbs water, causing the concrete to crack. The layer of compressed asphalte follows, and thus unsatisfactory repairs are made, for repairs on a shifting concrete, through which the wet can rise, never last long."

"In preparing the roadway of the Auteuil Bridge, Paris, a coating of liquid asphalt $\frac{5}{8}$ inch thick was laid down to keep out the surface water from the masonry, then a 3 inch bed of sand by order of the government engineer, who feared least the immediate contact of the rough concrete with the asphalt mastic would damage this coating. On the top of the sand was put a layer of 4 inches of hydraulic lime concrete, and on the top of the concrete 2 inches of compressed Val de Travers asphalte. The rain-water filtered through the curbstone into the layer of sand; in hard winters it froze and forced up the concrete, and in summer the sand yielded under heavy traffic. In 1877 the roadway of the Pont Masséna, Paris, was laid. Nine inches of Portland cement concrete was placed upon the liquid asphalt coating, and upon that a layer of compressed Val de Travers asphalte $2\frac{1}{4}$ inches thick. It never moved though subjected to heavy traffic.

From the foregoing it appears that, for asphalte, good foundations of Portland cement concrete must be laid not less than 6 inches thick, but 9 inches is better. Lime and Roman cement concrete should never be specified for heavy traffic. Bituminous concrete is too expensive for ordinary work, though invaluable in special cases.

A lengthy discussion followed the reading of Mr. Delano's paper which was participated in by a number of engineers who together brought out many points of valuable experience.

Mr. E. J. Harrison had under his control on behalf of the Val de Travers Company, the majority of the asphalte roadways in the city of London. He said that the first that was laid was in Threadneedle street in 1869. It consisted of 2 inches of compressed Val de Travers asphalte on a concrete foundation. It was at the time he spoke within two months of eleven years old, and was then, as it always had been, in good condition. Some new Aberdeen granite blocks had been laid beside it for a trial of endurance, and seven years afterwards it had got into such a state as to require redressing and resetting; but that was not done because when the inhabitants of the street learned that the street was going to be closed for repairing, they expressed a preference for an asphalte roadway which the city authorities gave them.

Mr. Harrison said he had been struck with the unanimity with which every speaker on that occasion urged the necessity of a solid foundation for a good road. An asphalte road was in reality a concrete road with a surface of asphalte put upon it to carry out certain ends. If the concrete foundation were taken away or tampered with, or negligently laid, asphalte itself would form a very sorry paving. For that reason, his company had always urged the desirability of laying a concrete composed of a quick setting Portland cement with the best obtainable ballast.

As far as his experience went, if a lime concrete was sealed up hermetically by asphalte on the top, there was no knowing what might happen underneath. The only failure that he knew in Val de Travers roadways had been in the use of lime concrete under lime mortar, in Holborn, opposite Gray's Inn. The specification prescribed about 9 inches of lime concrete with ¾ inch of lime mortar. When the concrete was ready to receive the asphalte, a fire broke out in Holborn, the place was flooded with water, the engines drove over the concrete, and the population of Gray's Inn trampled it down. It was subsequently made good and the asphalte spread. For five or six years the road was kept up at considerable expense, and then relaid. On removing the asphalte, it was found that the lime concrete had never set, that the mortar floating had never adhered to the concrete, but was mostly in powder, produced either by the action of the rammers or by the traffic afterwards.

Reference was made by several of the speakers to cracks both in the compressed asphalte and the mastic. They were generally attributed to defects in the concrete, arising from various causes. They usually appear in severe weather. Coarse sand in mastic is objectionable and causes disintegration. Mr. Chabrier noticed that cracks appear in work laid in wet weather. Mr. Delano observed that if mastic asphalte was placed on wet concrete it would blister and sometimes crack. He believed that cracks in nine cases out of ten resulted from the concrete.

Mr. Fogerty was of the opinion that if the concrete was laid almost dry and thoroughly rammed and jointed at intervals, the joints being left open until the water had evaporated, it might be covered with asphalte without any fear of cracks, provided there was a solid substratum. But when it was laid upon clay, difficulties would invariably arise unless there was interposed between the concrete and the clay a considerable amount of hard, pounded, dry filling for drainage purposes. The most difficult pavements were those laid upon a clay substratum, and he knew of no mode of curing the difficulty except by getting out a considerable depth of clay and replacing it by dry material.

Other causes of disintegration are due to deficient aggregation, which may arise from two circumstances, either the powder is too cold when laid, or it has been overheated. Overheating asphalte renders it as inert as sand. It is quite possible to make bad work with good materials, though the converse is not true. Still, when good asphalte, properly prepared and laid by skillful workmen, does not stand, it is almost always the fault of the concrete.

The consensus of opinion reached by this symposium may be stated thus:

That beginning at the bottom clay is a very bad foundation for a street.

That sand is but little better, both when wet throwing the concrete and asphalt when invaded by frost, and therefore requiring to be drained.

That lime mortar is worthless under asphalte.

That hydraulic cement or lime is better, but not good.

That 4 inches of Portland cement concrete will sometimes answer, that 6 inches is usually good, while 9 inches under any circumstances, will stand indefinitely.

That Seyssel or Val de Travers asphalte well laid, on a good concrete, well dried, is uniformly a success; that laid on a concrete deficient in either thickness or quality of material they will fail.

That any asphalte may be ruined if overheated, or laid on wet concrete.

That as very good streets have been made of almost every asphalte known, it is fair to conclude that a good street depends more upon the materials and technique of the concrete and in the care and skill exercised in laying the asphalte than in the locality from which the asphalte is obtained.

1. Minutes of the Proceedings of the Institution of Civil Engineers. Vol. XLIII, page 276. 1876.
2. Ditto. Vol. LX, page —. 1879-80.

DRESDEN TREE-CASINGS.

By Robert Grimshaw, Ph. D., C. E.

In most American cities the tree-boxes and other protective devices with which trees, young and old, are surrounded, are usually very primitive, and miraculously ugly. In Europe things are done differently, especially where large trees are transplanted bodily and set down in the middle of a suddenly-made park, or plaza. Also, where alterations are made, the trees are not cut down, as was the case in Washington Square, Philadelphia, and with Independence Square in the same city, where the intelligent (?) city fathers did not know enough to wind flag walks about standing trees of a century's growth, or even to run them along the desired line and leave the trees unharmed,

TREE-CASING IN DRESDEN.

but chopped and "hewed to the line."

Herewith are shown two illustrations of as many wrought-iron shields, or screens, or casings, or whatever they may be called, from George Platz, Dresden, Germany. They are good examples of the strong and the graceful combined with the appropriate and efficient, at not too great cost. One is open at the top, the other closed over; the latter being supplied with a sort of door or trap in the conical upper portion, to provide access to the growing plants at the base of the tree. The stone curb is substantial and rests on a good foundation; the inward curve of the lower portion of the fender saves the latter from injury by wheel-hubs, and gives grace to the design, and the little wrought-iron "frill" around the top is well worth the money that it cost, for the effect that it produces.

INTERCEPTING AND RELIEF SEWERS.

By Charles Carroll Brown, C. E.

The usual definition of intercepting sewer is "a sewer which is constructed to receive the ordinary flow of sewage from one or more main lines of sewer and dispose of it separately from the storm water." When the intercepting sewer is constructed to take the storm water from one or more main sewers, leaving the ordinary flow of sewage to flow down the main sewer, it is called a relief sewer. The purpose of an intercepting sewer is usually to separate the sewage from the storm water and discharge it at a point where less nuisance will be created, or where it can be purified, leaving the storm water to discharge into the nearest water-course. One purpose of a relief sewer is to relieve sewers which were originally built too small, by taking a portion of their discharge into the new sewer, thus building one new sewer instead of reconstructing several old ones. In a new system relief sewers or overflows may be provided where water-courses are near by or are crossed by the line of the sewer, thus making it possible to diminish the size of the main sewer by the amount equivalent to the discharging capacity of the relief sewer.

The principle of intercepting sewers has been demonstrated to be correct by many examples in European construction and by some in this country in the larger cities. The first class of relief sewers mentioned also has some examples and the latter class has one or two in this country. The purpose of this article is to show that the principles of intercepting sewers and relief sewers can often be applied to the sewer systems of smaller cities with advantage.

Our inland cities are all located on streams of greater or less size into which the sewage of the communities must be discharged either with or without purification. Heretofore there has been but little thought of the necessity of purification of the sewage, except in a comparatively few cases where the nuisance created or the damage caused has demanded action. In those sections where the population in cities is large as compared with the area, the question of sewage

purification is prominent, and as the population becomes more dense it will become more prominent in all sections. Wherever sewage purification is required it is necessary to diminish the amount of liquid to be purified to a minimum or the cost of purification will be too great to be borne. The first proposition made is usually to construct a separate system of sewerage, using the system only for house drainage and polluted discharge from factories, and the like. The storm water from streets, roofs, and yards must then be taken care of separately, either on the surface or by an additional system of storm water sewers. In many cases this system will be the most economical and will answer all purposes for many years.

There are, however, several instances in the country where the change in conditions and rapid increase in population have rendered the separate system almost entirely useless in a very few years. What is sufficient to take care of storm water in a town of small size, with streets paved with relatively porous materials and with good grades, neither too steep nor too flat, will be found entirely insufficient when it is desired to pave the streets with impervious materials, and when the area closely built upon is large, and nearly all the water falling in rain storms must be taken care of in the street gutters and culverts. If the grades are steep the collection of water at the foot of hills will cause sudden and damaging overflows and washouts. If the grades are flat the overflows will occur with less trouble from washouts but with more difficulty in removing water after the storm is over. Full consideration must therefore be given to the future of the town before deciding that the separate system is the proper one to adopt.

One strong point in favor of the separate system is its low first cost, but a proper application of the principles of intercepting and relief sewers will very frequently diminish the difference in cost between the separate and the combined systems, and in the long run will often secure a more economical construction than the separate system.

In a village or city whose area is nearly level, it will be found almost or quite impossible to get rid of the surface water when impervious streets are constructed without underground channels. This is especially true if proper construction of street intersections is made. The center lines of street pavements should extend across intersections without breaks, to give the best satisfaction in driving and the least expense for repairs. To best secure this on streets with low gradients, it is necessary to provide for the removal of the water from the street at the corners, and this can only be done by means of sewers. Culverts can sometimes be constructed to carry the water across the intersecting street, but they make a bad break in the street surface, expensive to keep in repair and inconvenient to travel. Open channels or gutters across intersecting streets are always objectionable and it is worth considerable money to get rid of them. If the area drained by the street gutters which converge at a given point is too large, damaging overflows of adjoining property occur, and necessitate the construction of sewers to take care of the excess. Where the street gradients are steep it will be necessary to remove the water from the street at many street corners to prevent dangerous accumulation of water at the foot of the hill. When provision is made to remove the water only at the foot of the hill it

can often not be made sufficient for heavy rains. When buildings cover a large part of the area of a block, the amount of water discharged into the street is greatly increased and the rapidity with which it reaches the street is especially increased, so that a separate system in the business portion of a village may very shortly be outgrown. These and similar reasons may be given for putting at least a portion of the surface water into the sewers. A proper consideration of the matter of economy frequently demands this course.

When the storm water is admitted to the sewers their sizes and cost rapidly increase. To keep the cost within reasonable limits the size must be kept at a minimum for safety. There is seldom a village or city which does not have one or more small water-courses running through it which can be utilized to carry off the storm water, although the ordinary flow of sewage could not by any possibility be discharged into them. Proper overflows or short relief sewers can be put in at proper places to discharge everything beyond a certain fixed amount into the water-course, thus permitting the main sewer to be reduced in size to carry only this fixed amount. The first street washings of a storm are almost as objectionable as the house sewage, so the extension of the main sewer should be large enough to carry the regular maximum flow of sewage and this first street wash, or should have say three times the capacity necessary to carry the sewage proper. In this manner the main sewer is kept at the minimum size, its cost is reduced, and if purification is ever found necessary, the minimum amount of sewage is presented for treatment.

Another case—the same in principle but different in construction—is that where the main sewers may discharge directly into the stream when the sewage is largely diluted with rain-water, but which would be seriously polluted by the discharge of ordinary sewage. Here an intercepter can be constructed below the level of the main sewers and connection made with it at points of intersection so that the ordinary sewage flow can run into the intercepter and the water flow into the stream only when rain-water sufficient to dilute the sewage the desired amount has found its way to the main sewer.

Each village or city will present its own variations on the problem and there are endless combinations of the four elements, combined sewers, separate sewers, partly combined and partly separate, intercepters and relief sewers. The skill of the engineer and his judgment come into play in determining which combination is the best and the most economical for the given location, due consideration being given to the local conditions and to the future prospects of the place, and to the matter of final disposal of purified or raw sewage. It is evident that a village or city can not afford to begin the construction of sewers until the question has been thoroughly studied by an expert and a full plan for a system has been devised.

STANDARD SPECIFICATIONS FOR SEWER PIPE AND PAVING BRICK.

The committee of the Illinois Society of Civil Engineers and Surveyors, on Standard Specifications and Tests for Sewer Pipe, at the last meeting reported recommendations that all pipe be salt glazed, vitrified earthenware, of the hub and spigot pattern, that it be circular in form, with no variation allowed from a true circle, and that it be of the following dimensions:

Diameter of Pipe. Inches.	Length. Feet.	Depth of Socket.	Annular space. Inches.	Thickness of Shell. Inches.
3	2	1½	¼	⅝
4	2	1½	¼	⅝
6	2	2	¼	¾
8	2½	2½	⅜	¾
10	2½	2½	⅜	⅞
12	2½	2½	½	1
15	2½	3	½	1¼
18	2½	3	½	1½
20	2	3	½	1¾
24	2	3½	⅝	2
30	2	4	⅝	2½

The committee believes that it is fairer to the manufacturer, and will insure better results, to require a given crushing strength for each size of pipe, rather than require a certain thickness of shell. "This strength requirement," the committee says, "should be calculated so as to support with safety the weight of the earth coming upon the pipes. The support of the earth by friction along the sides of the trench is a large factor entering into the calculation, which we have had neither time nor facilities for determining, and for this reason would recommend that the thicknesses given above be adopted as standard until the proper investigation can be made for determining the strength."

The same committee was unsuccessful in its efforts to obtain from manufacturers and city engineers information which would be helpful to it in preparing standard specifications and tests for paving brick. The responses from city engineers amounted to but 23 per cent. of those addressed, and of manufacturers but 19 per cent., and much of the information received was not in usable shape. In consequence, the committee has abandoned its undertaking and will await the results of the work along the same lines by the committee representing the National Brick Manufacturers' Association, which, by the way, is not taking shape as rapidly as expected.

ORIGIN AND USE OF STEAM ROAD ROLLERS.

*By E. Purnell Hooley, Assoc. M. Inst. C. E.**

No published history of the first experiments in the manufacture of steam rollers is, as far as the writer knows, available for reference, but the following may be taken roughly as the earlier career of steam rollers. Many claims have been laid as to the first idea of steam rolling, and the writer has been many times informed by a man, now deceased, that he first gave the idea for a roller to a noted firm who had hitherto only made traction engines.

* Abstract of paper read before the British Association of Municipal and County Engineers.

He used to tell his story somewhat thus: "Many years ago I was laying the water pipes in ——. We could not satisfy the surveyor as to reinstating his roads. One of these ugly great traction engines kept going past our work, so I said to the driver one day, 'Just run your hind wheel up my trench.' It was a very wet day and down went the trench; I filled it up and had the wheel on it again, and so I kept on. When the surveyor saw my trench he said he had never seen a better job, and set about showing how the whole road could so be made, if a portion could be made with a comparatively narrow wheel, and thus you see I started the idea of steam rollers." Whether this really had anything to do with the original rollers the writer does not profess to state, but this man verily believed what he said, and may really have given the first thought for the matter.

In 1865 a roller was designed by Messrs. Gellerat & Co., of Paris. The roller wheels were carried by the bed-plate under the boiler. The crank shaft was connected to the two axles by two endless chains, both front and hind rollers being driven. The steering was effected by diminishing or increasing the distance between the ends of the axles by means of two blocks running on a right and left hand threaded spindle. When the axles were parallel, the machine of necessity traveled in a straight line. The disadvantages of this roller were — first, the smallness of the roller wheels caused the road material to be driven before them; second, the steering was slow and ineffective; third, the wide, rigid rollers destroyed the contour of the road; fourth, the fuel consumption was considerably over two tons per ten hours working; fifth, the road was left rigid instead of smooth. In 1865 Messrs. Morland & Co., feeling the crudity and unsatisfactory method of allowing the ordinary traffic to consolidate the freshly-laid road material, constructed a covered-in steam roller that weighed about forty tons. The idea of covering was naturally to hide the steam horror, but the result may be guessed, and the writer has never heard but that the attempt was a failure.

Whilst these spasmodic attempts were being tried, the originators of the present firm of Aveling & Porter were working to perfect their ideas. In 1865 a trial was made in Hyde Park by this firm in steam rolling. An ordinary traction engine had its wheels exchanged for heavy and wide roller wheels. The trial was considered a success, and the next improvement was the roller supplied by this firm in 1867. This may be interesting to explain in detail, as it marks the first and best change over previous attempts. The engine was an adaptation of the ordinary road locomotive, and was carried on four roller wheels of equal width, the two front acting as drivers, and the hind ones, being fixed on a turntable, formed the steering wheels and overlapped the space between the two driving wheels.

A single cylinder was placed on the forward part of the boiler, and was surrounded by a jacket in direct communication with it; the steam was taken into the cylinder from the dome on the top of the jacket. Priming in steep ascents was prevented, the use of steam pipes either inside or outside the boiler was thus avoided, and an important saving of fuel effected. From the crank shaft the motion was taken by spur gearing to a

counter shaft, carrying at the end the pitch chain wheel. The bearings of this shaft were placed in curved slots formed in the supporting brackets, so that the shaft could be raised, and the endless driving chain connecting it to the driving axle tightened it when necessary; a wrought-iron casing surrounded this driving chain, securing it from dirt or dust. The crank shaft carried a fly-wheel; thus it was anticipated it would be practicable to employ the engine for driving stone-breakers or other fixed machinery when not required for rolling. The pitch chain and brake wheels were keyed fast to the driving axle on which the roller worked free, so that when turning sharp curves either wheel could be thrown out of gear by withdrawing a wrought-iron bolt connecting it to the pitch chain or brake wheel. The turn-table was arranged to admit of the driving and steering wheels accommodating themselves to the curved surface of the road, it being hoped, the weight being equally divided between the front and hind wheels, that the compression would be uniform. A powerful friction brake, acting upon one of the driving rollers and worked by a screw from the foot plate, gave complete and rapid control over the machine. The roller was steered also from the foot plate by a chain attached to the turn-table, and worked by worm gearing. A tank to contain water and increase the weight was placed over the hind steerage wheel. The cost of this roller in Liverpool was about $5,000, and the daily working expenses amounted to about $2.50 per day.

About this period Mr. Paget, chief engineer to the Metropolitan Board of Works, published a pamphlet on the "Economy of Road Manufacture," which is generally supposed to have greatly popularized the use of the steam road roller. In this pamphlet he states that the French estimated the saving in steam rolling (although the French rolling was no more advanced than ours), merely through the longer duration of the road, at 50 per cent., as compared with horse rolling, and in support of this it may be stated that the Islington and other vestries made trials with a similar result.

In 1871 the Edinburg Road Trust purchased one of the first road rollers of this type, and from a report in *The Scotsman* of March 14th of that year it seems to have given great satisfaction. In 1872 a roller appeared known as the "Lemoines" steam roller, again a French experiment very much on the lines of the "Gellerat." The boiler, of the "Kesterton" type, is carried in a similar manner, the double cylinder engines being placed under the boiler. The steerage was similar, excepting that the power of driving the gear was obtained from the engines carried on the foot plate. The driving rollers followed the steering rollers, power being communicated to the driving axle by a spur wheel and pinion. The gear, etc., however, was much too complicated, and the disadvantages too many to enter into competition with a more simple type of roller.

In 1873 Andrew Lindeloff, of New York, patented a steam road roller, and claimed it to be the first successful road roller patented in America. The boiler, which was of the pot type, carried double-acting vertical engines, the crank shaft being connected to the driving rollers by a bevel wheel running in a spur ring on the end of the driving roller. The steerage gear consisted of a hand wheel and screw, working in a block pinned

on the end of the tiller, fixed to the vertical shaft of the steerage roller fork. Play was allowed for by a joint between the fork and the vertical shaft at its lower end.

Other rollers seem to have been attempted by John Whittingham, C. E., of Nantwich, and Robert Douglas, but the writer has been unable to ascertain that either of these rollers had a very long life or showed any improvement on those made by other makers, but they serve to prove that the public were becoming alive to the necessity of steam road rolling.

In 1873, at the Vienna Universal Exhibition, Aveling & Porter, finding their work was appreciated, but to what extent the writer knows not, brought out a new patent steam road roller of smaller type than the one that was supplied to Liverpool, which, without superseding it, presented some points of improvement and adaptability. The object of the invention seems to have been to obtain a cheaper and more universal roller than was easily arrived at with the type of roller previously described. While the general arrangement of the ordinary road locomotive was adhered to, the driving wheels were widened to form the side rollers, the space between them was covered, and the fore part of the boiler carried by a pair of steering rollers. This type of roller was more easily adapted to driving a stone-breaker and for doing the work of an ordinary fixed engine. Other advantages it possessed over the older type of rollers were: 1st, steeper inclines could be ascended; 2d, one man had the whole control of the engine instead of two; 3d, more easily adapted to traction engine purposes. This type of engine was most certainly a step in the right direction. Its great drawback, however, was in the fore carriage; the front rollers being tapered naturally had a tendency to run apart to the right and left of the engine. The wheels were kept in line by the front axle, which had thus a tremendous amount of strain and friction to withstand. The weight of this engine was eight tons, the power being 5-horse nominal. The conical front rollers gave rise to a certain amount of slip between the road surface and the roller wheel, and by means of this slip the designers intended to obtain a ramming, or downward, as well as the ordinary pressure produced by a roller on the road.

From this period, year by year, fresh models of varying importance have been introduced, more or less of value, but chiefly more interesting to the mechanical than the civil engineer. Thus the position of the driving gear was several times changed. Rollers were sent out with awnings fitted over the drivers. These may be an absolute necessity in countries with hot climates, but for English use a good suit of reliable oilskins is of far more value and utility. In Paris the authorities use or compel their contractors to use a 25-ton roller; but for English ideas this is far too heavy, and unlikely to execute any exceptionally good work.

Having thus far written only on the history of steam rollers, the writer would now turn the attention of the reader to the working of the rollers and their general usefulness. There are but few urban councils of any size or pretension to importance who do not possess or hire a steam roller for some period at least of the year, but there are still councils who look upon steam rollers with a contempt commensurate with the days of our ancestors, who objected to railways

coming near their towns because the advent of railways would spoil their trade on the river. The writer claims for himself some experience of the early days of country steam rolling, and well remembers the objections that were urged by those self-opinionated "members" who generally know, in their own estimation, far more about roads than their surveyor is paid to know. No portion of England is now better served with steam rollers than the birthplace of rollers, Kent, and for once the old adage as to the shoemaker's wife does not hold good. Objections first urged against rollers were—(*a*) More material would be required; (*b*) the material would be smashed; (*c*) more dirt would exist; (*d*) the roads would be so smooth as to be dangerous in winter; (*e*) all the drains would be broken in; (*f*) the cost of the roads would greatly increase; and (*g*) more expensive material would be required. At the present time, although so many councils use steam rollers, yet judging from the endless questions the writer receives on this subject, there are a vast number of councils, and, the writer is sorry to say, surveyors as well, who know but little of the good results of steam rolling other than the knowledge which they are so often loth to admit, viz: that "such and such a council has better roads than we have." Dealing with these objections as they occur, the writer will do his best to once more meet them.

(*a*) No more material is necessary than as of old at any given period. It is as easy to patch with a steam roller as without one, and the result of the two attempts will be found at least sixty per cent. cheaper in favor of steam rolling. No material wears out so quickly as the isolated patches placed on a county road and left to "settle" according to the traffic and nature, and no patches do so much damage to the remainder of the road as these patches neglected. The traffic avoids them, the outside edges are always liable to be chipped, whilst avoiding the patches the remainder of the surface of the road receives more than its due share of the traffic, and consequently the weaker sides are cut through while the stronger center is being patched. A steam roller patch is placed exactly where it is required at once, causes no inconvenience, no waste of material, and instead of costing day wages for raking or covering, costs possibly something under 12 cents per ton weight of material as against 25 cents for attendance and blinding, if the latter luxury is adopted by a council so short-sighted as to ignore steam rolling.

(*b*) The material is not smashed if a patch is properly prepared. The writer adopts the principle of always wetting the road before applying material, and opening the edge of the hole before covering with a patch, removing the fine detritus, applying the material of the gauge required, and covering the edges up with the removed detritus, blinding, well watering, and finally well consolidating the whole with a roller. The writer gives directions, which his foremen strictly carry out, that no patches are to be applied without the steam roller, and the road prepared in the way named.

(*c*) Instead of more dirt existing from the supposed smashing of material, there is considerably less, because with roads prepared as before stated, the material is consolidated whole by a roller, instead of kicking about and becoming chipped and generally disintegrated, as is the case without one.

(*d*) Steam-rolled roads must certainly have a smooth surface; but instead of this being urged against steam rolling, it appears, and always has appeared, as a strong point in favor of it. The short period of really slippery weather in winter, when a few loads of ashes or road scrapings will make the road safe, is of slight importance when compared to the great saving to horses and carriages, and the comfort of say eleven months of dry, clean, smooth roads to one month of slipperiness.

(*e*) With the present use of traction engines and large boilers, etc., that are being constantly carried over our roads, any drains that may be damaged by a steam roller would be equally likely to be damaged by these other heavy weights, and the number of shallow drains in country places must in time be gradually altered to suit the needs of an ever-increasing population.

(*f*) The increased cost of roads need not at any time exist through steam rollers, unless there is some great reason for so doing; but that at first bad roads are most expensive is only too well known to those surveyors who have councils who want everything done at once. The writer's experience is that only careful judgment is needed to avoid this. Let the year's material be apportioned as usual, and avoid coating or sheeting as far as practicable the first winter, allowing the roller to work and compress the uneven roads into as fair a shape as possible during the wet weather, and when the second year's material is to hand commence a graduated system of coating (according to the importance of land traffic on the road), so that the whole has a two years' start, those roads most needing it being the first to receive the coating and rolling. In a given period the work can be so arranged as to allow of every road receiving its proper share of material and the whole having the necessary covering, a system that is absolutely impossible without a steam roller.

(*g*) A generally heard statement is: "It is no use rolling our stone." The writer's answer has invariably been: "Then your stone has no business to be placed on the road at any time." If material will not stand a steam roller on a road properly prepared, it certainly will not stand the ordinary traffic, and the use of this bad material is the most wasteful and expensive way of maintaining any used highway. The writer uses 12-ton rollers on magnesium limestone for sides of roads, furnace slag for making up important roads and coating second-class roads, and granite for coating first-class roads.

Turning from these "objections" to the recognized work of a steam roller, the following may be considered the general work allotted to the machine, although when a roller is to be purchased, some enthusiasts go too far, and not only overrate the possibilities of the machine, but disappoint those who would be satisfied if such extraordinary capabilities had not thus been claimed, but ordinary results fairly stated. The recognized work of a roller the writer would divide as follows, for country districts especially—*viz*: Consolidating weak roads liable to break up at any period, patching a wearing road, rutting a road cut through, coating and sheeting, general traction.

Some of the most appreciated work the roller has executed for the writer has been the consolidation of roads that had previously been mismanaged with an

excessive quantity of material. What can be worse than a road in an everlasting state of loose stone? Is it to be wondered at that the general complaints are loud and deep at the condition of the roads and the consequent expense? Who does not know the county road, and, alas! the bye-road in the urban district, that has for its chief figure long lines of ruts, the heaped up material on either side of those ruts, the weary, expensive and irrational "raker in" constantly at work, and more constantly abused by every one? To this state of roads an end can easily be made. The material should be raked in, and the road leveled as well as it can be at once, the roller then applied and careful rolling commenced from the sides to the center, and without the application of any fresh material a level road is presented free from rough stones and ruts. If the rolling is sufficient, the good result is, no further ruts will appear, unless of course the road is neglected, and it again wears badly. The main point is, a good system has been commenced, the road is consolidated, and a level surface, the whole of which is available for traffic, is presented, instead of the deep, miry ruts, so long a nuisance previously.

Patching a road can be beautifully carried out by a skillful workman with a steam roller. Nothing can be worse than the state of a road "patched" with loose stones. Nothing is more likely to bring horses to grief. Nothing is more wasteful in road maintenance or calculated to irritate a person driving, riding or cycling. Every one knows the old-fashioned "bound to turn out" patch, and the wretched bar system of compelling traffic to go so far over rough stones, to be turned on to another rough patch further on. Every one who has had to manage such roads knows the result, and comparing the cost of materials consolidated by the steam rolling and the "turning out" method, there is at once a great saving in favor of steam-rolled roads.

Few modern surveyors would allow a road to rut, but the man of old-fashioned ideas will still continue this antiquated practice, unless he adopts the use of a steam roller; and why? Because it is next to impossible to avoid ruts. When ruts without a roller are filled up, we well know the invariable result. More ruts follow side by side in the same line, and again the second edition has to be treated similarly to the first, and so on. Now notice the difference in a steam-rolled rut. Take a road with the last rut well showing. Fill the rut up to its required face and roll it. Immediately the whole road is fit for traffic, and no fellow ruts appear. What can be clearer proof of the advantage of rolling and the saving of material.

Take again the old methods. How much of the surface of a road can be coated even on a busy thoroughfare, where, if anywhere, the traffic can consolidate the newly-applied material, without more material being applied to regulate and level the surface, necessitating extra material where the original was sufficient, and piling up material where it is not wanted? How can a road have its proper contour retained? What is the result? A bumpy, uneven road, more than necessarily round and high in the center, to allow of surface water escaping, and with weak sides that allow of the center being cut through with the first excess of lateral pressure. Try the effect of rolling the same coating; the road

is fit for traffic within as many hours as the hand-regulated coat is in weeks. There is no filling up or excess of material, and the whole road is available for use, for the center is not too high and the sides are not too rough. The surface is much smoother, water freely leaves it, and mud and dust are not the chief component parts, to be expensive and needless later on.

Still dealing with county roads, who has not had to deal with narrowed roads, at times so narrow as to become most expensive in maintenance, through the continued following of vehicle after vehicle in the same track? How has this narrowing occurred? Mostly by material being applied to strengthen the roads at the sides, and never having been consolidated, lying rough, mud being scraped over it, becoming grass-grown, and finally past siding, hence the consequent narrowing. If a road side requires strengthening (and how very many of our county roads do require such treatment?), nothing is easier with a steam roller; the material can be coarser and cheaper, and yet serve its object; the packing of the material together and the rolling prevent the grass growing, and again leave the whole road complete for traffic.

The writer's experience is that there is plenty of work for one steam roller on either about an average of 90 miles of macadam main roads, 150 miles of district roads, or 50 miles of ordinary urban roads, to keep it regularly employed without any other work, for the very best work can be performed with this machine during the summer; in fact, on county roads it is far preferable to roll during the summer than winter. The writer uses his rollers all the year round without any stoppages.

PORTLAND CEMENT SPECIFICATIONS.

In another column we have made very full abstract from an article prepared by Mr. Wm. J. Donaldson, urging the adoption of standard specifications for Portland cement. The writer is to be commended for endeavoring to put the question of cement specifications upon a better basis, as well as for the many valuable suggestions and arguments which he advances.

The requirements specified are, in general, good, though there are a few clauses to which cement makers may justly take exception. For instance, the manufacturer who is bending all his energies toward producing a cement that is practically perfect on leaving the grinding mill, or who has installed expensive machinery to assist in aërating his cement quickly, may not like to be required to keep his product in store thirty days before shipment.

The value of the "certified tests on every car load" is not apparent since such tests are to be "in no wise a guarantee of acceptance." In the matter of chemical analysis, it does not appear that one would necessarily be warranted in rejecting a cement which does not conform to the rather narrow limits set for the silica, alumina and lime, and it will usually be considered that the limit of sulphuric acid should depend on the use for which the cement is intended rather than upon its time of setting.

The arguments for fine grinding are set forth in an able manner; too much stress can hardly be laid upon this point, for although it is generally conceded that fine grinding is desirable, its great importance from an economic point of view is not always sufficiently appreciated. Since manufacturers generally screen their product, as it leaves the stones, through a sieve having at least 50 meshes per square inch, it is evident that such a sieve will give but little information concerning the actual fineness of the product. Hence, while our views are in strict accord with those advanced in the pamphlet concerning the use of finer sieves, we believe that the fineness specified would at present reject many of our best cements. Perhaps it is considered, however, that the manufacturers will have attained this degree of fineness by the time the specifications are adopted. In setting forth a standard specification, the writer should have been more explicit concerning the sizes of the sieves recommended for use. What is "standard brass gauze"? What size of wire is standard for a "No. 200" sieve?

The hot test advocated is a severe one, and although it may be shown to be a proper test to adopt, it would seem that at present a more conservative temperature would have met with more general approval.

These suggestions, however, are minor points about which opinions may differ, and we do not wish to criticise adversely the specifications as a whole; but we do wish that the writer had gone further and outlined a method by which the different operators would be able to work to the same specifications and obtain for the user the quality of cement desired without doing injustice to the manufacturer. It is not alone a standard specification that is needed—a standard method of testing and men capable of interpreting and using these specifications are also required.

It is recommended that a laboratory in a neighboring city be selected for making all the tests in a given locality, but sometimes the "neighboring city" does not exist, and when it does, the laboratory may turn out quite different results from a given lot of cement, than would be obtained in the laboratory selected for a different locality, because of the difference in what has been termed the "personal equation" of the operators. The idea that different operators, working apart from one another with the methods now in use, obtain results that are comparable, has been sufficiently exploded. The most crying need in cement testing is for standard methods which shall reduce to a minimum the effect of the personal equation of the operators, and these must come before standard specifications. Let us agree whether we shall mix the cement in a pan, knead it by hand, mix with a trowel on a slab, with a hoe in a box, or with one of the several mixing machines. Let us agree as to whether we shall press the mortar into the mold with the fingers or the thumbs, ram it with a rod or pound it with a hammer, press it with a trowel or with a given weight on a plunger. Shall we keep the briquettes in running water, and if not, how often shall we renew it? At what rate shall we apply the tensile stress in breaking and what form of clip shall we use? In testing fineness what relation should the diameter of the wire bear to the size of the opening? It is true that some of these things have been considered in the report

of the committee of the American Society of Civil Engineers on a uniform system of cement testing, but this report is now nearly ten years old, and however excellent it was at that time, and however well it may still apply to some questions, it is well known that many of the foremost authorities are departing from the methods suggested, and it is probable that none would be more in favor of its revision than the very able engineers composing the committee that submitted it.

There is this to be said of the specifications suggested by Mr. Donaldson. It would be almost impossible for a defective cement to pass all of the requirements. But, on the other hand, much good cement might be rejected under them, especially by operators who are not very skillful. The writer evidently contemplates that none but the most capable men shall test the cement used by the government and that these men shall endeavor to obtain the highest possible results in tests for tensile strength. Some manufacturers have recently suggested that engineers should specify only the requirements of efficiency in cement work and leave it to the manufacturer to produce the required result in his own way; in other words, that engineers should buy cement as they now buy a watch, on the reputation of the maker or guaranteed for twenty years. Buying by reputation would at present, however unjustly, work to the disadvantage of the American manufacturer; hence, the guarantee plan is the only one to consider. From this suggestion it is apparent that some manufacturers think they have had good cement rejected on account of unjust requirements or of unskillful cement testing. That this injustice is real and not fancied is probably conceded by most engineers, but has it become so bad that manufacturers are ready to take upon themselves such onerous requirements as are exacted of contractors for some kinds of street pavement? We can not believe that the majority of cement manufacturers would care to make the change, and it is still more certain that engineers in charge of important work would not consider such a step.

Would it not be possible to formulate a scheme similar to that in vogue in Germany by which justice could be done to both the user and the maker of cement? Does not the government use enough cement annually to establish a central testing laboratory with temporary branches at such places and during such times as they would be required? All of the branches might be kept in touch with the central laboratory by having all of the operators first trained in the latter, and then sent from place to place for a year, more or less, as required, occasionally being returned to the main laboratory to be "checked up," as it were. Important matters might be referred to the head office where would be stationed permanently a recognized expert of high standing, as well as the most skillful operators. The benefits of the system might be made available for private individuals by the payment of a proper fee.

When good cement, suitable for the work in hand, is rejected by an engineer, the specifications are wrong or the testing is wrong. Will standard specifications remedy this evil? Not unless the method of testing is also up to a "standard" grade. Until cement testing has been reduced to a machine process will it not be better for each engi-

neer to specify such requirements for tensile strength as he knows he can obtain with the quality of cement he desires? This, of course, does not apply with equal weight to other requirements, such as specific gravity and chemical analysis.

Whatever the solution of the problem may be we trust that the increasing interest which is being evinced in cements and their proper testing will eventually secure to the manufacturer just treatment, and to the engineer the quality of product required. C.

SUGGESTED SPECIFICATIONS FOR PORTLAND CEMENT.

We are in receipt of a pamphlet by Mr. Wm. J. Donaldson entitled "Suggestions and Argument for the Adoption by the United States Government of Standard Specifications for Portland Cement."

After noting the lack of uniformity which exists in the specifications prepared under the direction of the engineers in the various departments of the government, Mr. Donaldson comments upon the low requirements for fineness and tensile strength, and deprecates the practice of requiring that the cement shall be equal to a stated brand.

The specifications urged for adoption by the government in all departments using cement are as follows·

All cement used to be well seasoned Portland cement, and must conform to the following requirements and be capable of passing the tests herein specified. Manufacturers to guarantee that all cement has been seasoned, or subject to aereation at least thirty days before leaving the works.

Manufaeturers to furnish certified tests, from their laboratory, on every car load when shipped; such tests to show they pass the stated requirements, but which shall in no wise be a guarantee of acceptance by the government. This provision acting only as a guide to the cement manufacturer, as acceptance or rejection of cement will be made on government test.

Packing.—Cement to be packed in strong and well-coopered barrels, 400 lbs. gross, or in strong cotton duck bags, three or four bags to the barrel, and 380 lbs. of cement to the barrel.

Sampling.—Samples to be drawn from at least 10 per cent. of every one hundred barrels received, the government reserving the right to sample every barrel. Samples to be drawn from the interior of barrel or bags by an iron tube (after the pattern of a molasses gauger), and thoroughly mixed as one sample. Tests to be made from the average sample taken from ten barrels, representing the lot of one hundred barrels sampled. Acceptance or rejection to be made as the tests meet or fail to meet the requirements.

Chemical Composition.—Full chemical reports to accompany each shipment, the government reserving the right to analyze every sample taken, which must conform to the following requirements, and be a tri-calcic silicate cement:

Lime	62 to 66%
Silica	20 to 22%
Sesquioxide of iron and alumina	8 to 12%
Magnesia	not over 3½%

Sulphuric acid,
not over 2%, for slow setting cement.
Sulphuric acid,
not over ½ of 1% for quick setting cement.

The proportions of lime to silica shall be about three to one.

Time of Setting.—A cake of neat cement to be moulded on glass to determine time of setting:

Slow setting,
Initial set to be over 30 minutes.
Final set to be not over 12 hours.
Quick setting,
Final set to be not over 30 minutes.

Slow setting cements to be used in all cases, except for submarine work and in places where water and tides interfere with slow setting cements.

Fineness.—Cements to be of such fineness that 95%, by weight, shall pass through a No. 100 sieve, having 10,000 meshes per square inch; 80%, by weight, shall pass through a No. 200 sieve having 40,000 per square inch.

Checking and Cracking.—Two cakes of neat cement to be moulded on glass. One to be immersed in cold water, after having set hard, and examined from day to day for surface checking and warping. The other, after having set hard, to be immersed in water 212° Fahrenheit, and al-

lowed to remain in the water at that temperature for 24 to 36 hours. Examination to be made of the pat at the end of that time for constancy of volume and checking. Should the pats become contorted, or show signs of cracking or warping, the cement will be rejected.

Specific Gravity.—The specific gravity shall not be less than 3.00.

Tensile Strength.—Neat briquettes shall stand a minimum tensile strain per square inch without breaking:

12 hours in air and 12 hours in water . 200 lbs.
1 day in air and 6 days in water. . . 500 lbs.
1 day in air and 27 days in water. 650 lbs.

Sand, mortar briquettes, 3 parts of sand (No. 4 standard crushed quartz) to 1 of neat cement shall stand a minimum tensile strain per square inch without breaking:

1 day in air and 6 days in water. . . 150 lbs.
1 day in air and 27 days in water . 250 lbs.

Under the head of "Specification for Manner and Method of Testing," Mr. Donaldson advocates for time of setting the use of the wire suggested by General Gilmore, namely, a wire $\frac{1}{12}$ inch diam., weighing $\frac{1}{4}$ pound for "initial set" and a wire $\frac{1}{24}$ inch diam., weighing 1 pound for "final set."

The items concerning fineness and soundness are as follows:

Fineness.—Pass 100 grammes of cement through a No. 100 and No. 200 standard brass gauze sieves (containing, respectively, 10,000 and 40,000 meshes to the square inch). The weight of each residue gives the percentage of fineness of the cement passing through these sieves.

Hot and Cold Water Test.—Mould two pats of neat cement as heretofore described under setting. Allow same to set in air (covered with damp cloth to prevent surface drying) for twenty-four hours.

Immerse one in cold water and allow it to remain in water for an indefinite period—for at least seven days—examining it from time to time, for warping, checking and cracking.

Immerse the other pat in water 212° Fah. and allow it to remain for twenty-four hours in the water at the same temperature, at the end of which time remove the pat and examine for disintegration and constancy of volume.

Under the head of "Mixing and Gauging" occurs the following:

Mix and knead the cement thoroughly by hand, using rubber gloves as a protection, and afterwards troweling it in order to bring it to a fine edge, and causing it to shed water. After being thus thoroughly worked until the mass is homogeneous, proceed to fill the moulds, having first wiped the inside with an oily cloth, in order to prevent sticking, and laying them on a flat, smooth piece of slate. Press the cement in with the thumbs, being careful to allow no air bubbles in the cement. Having filled all the moulds, smooth them off with a spatula or trowel, upon which a slight pressure is exerted.

The following paragraph gives the method recommended for making sand briquettes:

In the case of sand briquettes weigh out 600 grammes of sand and 200 grammes of cement, and mix dry in a pan, add half the percentage of water ascertained in the neat test. Mix this mass well on a slate slab, to thoroughly incorporate the sand and cement, using a trowel for this purpose. This complete mixing is very necessary in the case of a finely ground cement. Care should be taken that the mortar does not become too dry during the manipulation; if it does, dip the trowel in water, which will be sufficient to keep it moist. Having thus mixed it well, press it into the moulds, previously arranged as in the case of neat cement. Smooth and trowel the top and bottom of the briquettes, turning them carefully for this purpose, in order to bring the most cement to the surface, thus filling the voids and making both sides of the same degree of smoothness. This will prevent one side from being more absorbent than the other when immersed.

The sand recommended is "standard crushed quartz, No. 4, capable of passing a No. 20 sieve and caught on a No. 30 sieve (sieve standard brass gauge, having 400 meshes and 600 *meshes to the square inch respectively)."

The following general remarks and summary of advantages claimed for the system advocated complete this portion of the article:

When wiping rapid setting cements care should be taken that the initial set does not take place before moulding; if it does, the mass should be rejected. Care should always be taken to keep the briquettes completely submerged in the water while immersed, and make the test as soon as they are removed from the water. Stand the briquettes on end while immersed in the pans, so that the maximum surface will be at all times exposed to the water.

Mark in each briquette a number, same referring in some suitable record book to

*900 meshes is doubtless intended.—[ED.

brand, days of making, testing, breaking and full tests and properties of cement.

The advantages derived from uniform specifications and manner of testing such as advocated are:

First. A standard system applicable alike for all departments.

Second. Knowledge of the proper and economic use of Portland cements.

Third. Higher standards and consequent rejection of inferior brands, due to an accurate system of testing.

Fourth. All cements placed on an equal footing and merits determined.

Fifth. Incentive to the betterment of quality.

Sixth. The fostering of an American industry.

The rest of the article is taken up with arguments for the adoption by the government of such standard specifications as are submitted, and we make the following extracts from this concluding portion:

It has always been the policy of the United States government to assist the development of home industries and promote the use of the product, wherever such article is equal in quality and cost to any produced in other countries.

Notwithstanding the enactment of measures furthering this industry, the deep-rooted theory still prevails among many engineers and architects that Portland cement of the highest standard can only be produced in Europe, thus hampering the industry in this country and preventing it from assuming the position it naturally deserves. Strong influence brought to bear by foreign industries has created this feeling of distrust, and the fruit of which we see constantly in the acceptance of foreign brands on faith; oftentimes without any technical investigation as to the merits; whereas, when American brands are submitted they are compelled to undergo critical scrutiny and are presumed to be defective until technical examination proves them otherwise. Examples have even been cited by some prominent engineers, where work made from some American Portland cements has proved defective, no allowance in such cases has been made for possible inferior foreign materials, such as sand or stone, or poor workmanship, but the fault being laid at once to the cement, without further investigation, simply because it was an American Portland cement. Contention is even made by some engineers that, from their experience, one brand of American Portland cement having proved faulty, necessarily all other makes of American Portland cement must be the same; whereas the same engineers will admit, and in the same breath, that there are many brands of imported cements which in their estimation are radically wrong. This is altogether unjust and unreasonable, simply a matter of prejudice.

In order to obviate this and rectify other defects, we ask that a uniform and specific standard for quality and method of testing shall be created by the United States government, compelling its enforcement over all departments. If such were enacted by the United States government, sufficient quantity of the highest grade of Portland cement to meet the high requirements advocated in this paper, for use on any government work, could be furnished by the American manufacturers. * * *

There are several good and substantial reasons why some concerns in this country can manufacture a higher grade and more perfect Portland cement than can possibly be attained in Europe. In the deposit of natural Portland cement rock (technically speaking, argillaceous limestone) found in certain localities of this country —more especially in Lehigh county, Pa., and Warren county, N. J.—the raw material containing the lime and clay combined by nature, in sedimentary formation, is especially adapted to the improved processes of calcination which have, within recent years, been established. As the essential feature in the manufacture of Portland cement of the greatest strength and highest quality attaches itself to the perfect chemical combination of the lime and silica (in a tricalcic silicate), the processes employed in this country attain such results to a higher degree of perfection than the European Portland cement factories, mixing, as they do, the clay and lime by mechanical means. This insures greater strength and stability, due to the minimum amount of free lime in the cement.

As many of the American manufacturers have attained to the maximum of inert strength and stability in their Portland cements, due to their advanced processes of calcination being adapted to their raw material, their attention is now being more especially devoted to the fine grinding of their finished product, realizing as they do, that such a quality is an essential feature for the highest grade of engineering work.

The advantages to be derived from the use of a finely-ground cement are:

First. The mortar or concrete will reach its maximum strength in a shorter time.

Second. Greater amount of sand can be carried by the cement.

It is only the impalpable powder of a hard-burnt tri-calcic silicate cement, or that portion passing through a No. 200 sieve, having 40,000 meshes per square inch, that will perform at once the work intended, or act in setting and binding. The more impalpable powder there is in a cement, the more active that cement will be, and the more work it will perform, due to its ability to cover more grains of sand.

The sooner, also, will the mortar or concrete get its maximum strength.

It is quite evident that it is preferable to use those cements which acquire great hardness in a short time. It is always an advantage when the hardening of mortar is not too slow, because the structure is placed, in a short time, beyond all dangers. A Portland cement (to be of the highest quality) should be slow setting, but after set it should harden rapidly. This quality is characteristic of hard-burnt, tri-calcic silicate, finely-ground cements.

The residue on a No. 200 sieve of such a cement acts like so much sand, and should be accounted such, as it has no active properties.

To illustrate what this signifies, the following example is submitted:

Using the No. 200 sieve as a basis for determining the impalpable powder, or only that portion that is active; the residue being classified as sand:

First. 70 % of the cement passing through this sieve, in a composition having one barrel cement and three barrels of sand, for mortar:

1 bbl. cement, 100 parts = to
70 parts cement and..... 30 parts sand
3 bbls. sand, 300 parts = to 300 parts sand

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70 parts cement and 300 parts sand

Or by actual computation:

1 part of cement to 4.71 parts of sand.

Cement capable of passing from 80 to 85 per cent. through a No. 200 sieve will give no perceptible residue in either a No. 50 or a No. 74 sieve, and therefore it follows that these sieves are of no practical use, and have been left out of the stated specifications. As in practical use, cement is only used with sand for mortar, it follows that the next test is of much less importance in determining the strength.

Instead of the present custom of specifying a brand, because it possesses Portland cement characteristics, without accurately determining the true force and active principle of the cement, it would be far better for the engineers to determine by proper scientific methods.

1st. The actual strength of the cement as determined by the sand test.

2d. The actual amount of impalpable powder or active principle in the cement, as determined by the No. 200 sieve.

3d. The stability.

If this is done, then the engineers and architects will be able to figure how to attain in the work the maximum strength with the lowest degree of cost.

The quality of Portland cement does not depend alone on fine grinding and perfect calcination, but is influenced by aereation, or the proper seasoning of the finished product.

Certain characteristics which principally affect the setting properties of the cement are only developed in freshly ground cements and are eliminated by seasoning. The important quality of slow setting in Portland cements is developed from this proper seasoning.

The stability of Portland cement also depends on this proper seasoning, as well as fine grinding. This is due to the fact that the seasoning of cements causes the hydration of any free or caustic lime, which may be in the cement through imperfect calcination.

The proper seasoning of Portland cements has brought up another point in the consideration in the method of shipments. Foreign cements can only be shipped to this country in barrels because of the excessive dampness in the holds of the vessels; whereas, in Europe the majority of the Portland cement is packed and shipped in cotton duck bags. The chief advantage derived from shipment in bags lies:

1st. In the reduced cost owing to the elimination of the cost of the barrel.

2d. To the advantage derived from the greater exposure to the air and more perfect seasoning, improving its quality, which is attained to a less degree when shipped in barrels.

3d. The facility in handling, as one bag weighs but 95 pounds, which is one-quarter of a barrel.

It is becoming the custom in most large cities of the Middle, Atlantic and New England States to use American Portland cement in cotton duck bags.

The chief objections offered against this mode of shipment by the United States government engineers are:

1st. That the quality of the cement will deteriorate from supposed liability to weather exposure; whereas, the reverse of this is the case.

2d. Because all foreign Portland cements are shipped to this country in barrels, which is shown to be due to the different conditions in the mode of conveyance.

Shipment in bags is equivalent to shipment in bulk, as far as the price is concerned, as the bags are returnable when empty, this being an advantage to the consumer in his ability to purchase the cement at bulk price, which is less; and to the manufacturer, because he is able to compete to better advantage with foreign competition.

Were specifications adopted such as we recommend, little advantage would be derived by either the government or the manufacturers, unless a uniform system was made standard for the manner and method of testing Portland cements.

Imperfect results in testing are mainly due to the lack of information and imperfect inspection. No two results obtained under the present method of testing can be the same, and therefore a comparison of results on the same cement is impossible. The variation in results, which even on the tests of the same sample, are so ap-

parent, is due frequently to the individuality of cement testers operating under different systems; whereas, this would be obviated if a specific and uniform method of testing were adopted which all cement testers would be obliged to conform to. This would also prevent inaccuracies from lack of knowledge as to method.

Scientific testing, under a uniform and specific method, performed by competent persons, thoroughly conversant with the subject of cement in both its chemical and physical properties, and having the ability to discern and exercise proper judgment of results, alone can determine the economic value and stability of Portland cements in a scientific way. Such cement testers should be men of scientific training and attainments. * * *

In conclusion we have only stated facts as they now exist, and urged the adoption of one standard, and that high, in the specifications for quality, together with a uniform and specific method of testing, which will prove advantageous to the United States government and directly encourage an industry that needs recognition and support on these lines from the United States government, to make it one of the most useful and productive industries in the world.

THE PHILADELPHIA CONTROVERSY OVER PORTLAND CEMENT.

In the July number of MUNICIPAL ENGINEERING the following article appeared :

A large quantity of Alpha Portland cement was recently rejected in Philadelphia because it contained 2.6 per cent. of magnesia, when the specifications restricted the allowable proportion to 2.5 per cent. The architects in charge of the work were acting in accordance with advice from Booth, Garrett & Blair, who, it is understood, prepared the specifications over which the controversy has arisen. W. J. Donaldson, of the Alpha company, contends that the restriction is too severe and that it is aimed at the Portland cement industry. German authorities are cited in support of the statement, and it is claimed that 8 per cent. of magnesia is safely allowable. Within the last few days new specifications have been prepared by Booth, Garrett & Blair, allowing 4 per cent. of magnesia, but they say that this will be revised, as they have discovered several errors which they wish to correct before publication of the specifications.

A few days after the publication of the July number a letter was received from Booth, Garrett & Blair, who said that the article referred "to a transaction which was purely private in its nature, and the statement made in regard to the transaction is utterly false in fact and malicious in intent," adding that they were sure the magazine would not knowingly be a party to "this sort of thing," and asking to be set right. In reply, Booth, Garrett & Blair were assured that there was certainly no disposition to do them an injustice, that the information on which the article was based had come to us in a way that seemed to give no room for doubt as to the facts, and that, if it should be found, after investigation, that an erroneous statement had been made, it would be corrected. At the same time they were reminded of their promise to furnish us a copy of their corrected cement specifications.

Immediately on receipt of the letter of Booth, Garrett & Blair, the editor of MUNICIPAL ENGINEERING wrote to Mr. W. J. Donaldson, of Philadelphia, reminding him that the information contained in the article in question had been obtained from him by a representative of the magazine, who had called upon him in company with Mr. W. G. Hartranft, vice-president of the Commercial Wood and Cement Co., and advising him of the assertion of Booth, Garrett & Blair that the statements were "utterly false in fact and malicious in intent." We said to Mr. Donaldson that, while

we were confident that the article was in accordance with the information obtained from him, still, in view of the contradictory assertion of Booth, Garrett & Blair, and their request to be set right, we desired him to advise us whether the article was false in any particular; if so, we should make a correction, in justice to Booth, Garrett & Blair, whom we had no thought of putting in a false position, but if not, there was, of course, no correction to be made. A telegram from Mr. Donaldson five days later, sent from Phillipsburg, N. J., advised us that our letter had been delayed in reaching him, on account of his absence from his office, but that it would be answered within a week, on his return to Philadelphia. About ten days afterward the following letter was received from Mr. Donaldson:

PHILADELPHIA, PA., July 20, 1896.

Municipal Engineering Co., Commercial Club Building, Indianapolis, Ind.:

GENTLEMEN:—I beg to acknowledge the receipt of your esteemed favor dated the 9th inst., and I note the article in your July issue, entitled. "Controversy over Cement Requirements," and also that you have received a communication from Messrs. Booth, Garrett & Blair, in which they state, "This article relates to a transaction which was purely private in its nature, and the statement made in regard to this transaction is utterly false in fact, and malicious in intent."

It is true that Mr. W. G. Hartranft brought to my office your representative and asked me to explain the difficulty which we were having with our cement on the Presbyterian house, Philadelphia, which I did. I do not see, in this article, that the statements made are utterly false.

Our cement was used on most of the foundation work of that building, and after the foundations were nearly completed with our cement then the issue was raised as to the magnesia in the cement, and the cement was rejected because it then exceeded 2½ per cent. in magnesia. The cement, however, which we had furnished, and which had been accepted, was made from the same rock as the cement which was rejected.

Messrs. Booth, Garrett & Blair might take exception to the statement in your paper that "the architects in charge of the work were acting in accordance with advice from Booth, Garrett & Blair, who, it is understood, prepared the specifications over which the controversy has arisen."

I took the stand that Messrs. Booth, Garrett & Blair stood in the position of advisors to the architects in this matter, and I so informed Messrs. Booth, Garrett & Blair, as well as the architect. They both informed me that this was not the case; that the architect drew up his own specifications without consulting Booth, Garrett & Blair, and I think I so informed your representative. In view of these facts I naturally had to withdraw the assertion I made that the specifications were drawn up by Booth, Garrett & Blair.

Messrs. Booth, Garrett & Blair issued specifications some time ago advocating the use of Portland cement not to exceed 2½ per cent. of magnesia, and they had the contract from the architect of the Presbyterian house to test all the cement that went on that operation.

The Alpha Portland cement was satisfactory with the exception that it exceeded by a few tenths of one per cent. the limit of magnesia noted in the specifications, and I consequently endeavored to have the architect change his specifications to allow our cement to go on the work, I agreeing with him that our cement would not exceed 2.8 per cent of magnesia. I consulted with Messrs. Booth, Garrett & Blair about the matter, and asked them to assist me, but they refused to do so, claiming that they were not prepared to advise the architect to raise the magnesia limit in his specifications.

I felt, from honest conviction, that Portland cement that had even 3½ per cent. of magnesia in it was just as good as one that had 2½ per cent. The architect told me that he would consult Messrs. Booth, Garrett & Blair and find out what their opinion was in the matter. Messrs. Booth, Garrett & Blair took the stand that magnesia was only present in cement on sufferance, and the less of it the better.

A very short time after this controversy, they issued printed specifications, placing the limit of magnesia for all work, excepting work done in sea water, at 4 per cent. and they sent a copy of these specifications to the Alpha Portland Cement Co. A week or ten days afterwards they wrote the Alpha Portland Cement Co. a letter stating that they would like to have them back, as there were errors in them that they wished to correct. These are the facts.

During the controversy that I have had with Booth, Garrett & Blair and Mr. Huston, the architect, I can say there was no desire on my part to show a malicious spirit, but I was actuated solely by the desire to prevent the architects in Philadelphia, in drawing up their specifications, from putting the limit of magnesia at 2½ per cent., as by doing so it

would have barred the leading brands of American Portland cement from being used on any work under their supervision. I did this, because from my own experience, which covers a period of about ten years, by comparative results, I know that up to 3½ per cent. of magnesia in cement, it is never detrimental to the quality of Portland cement.

The rejection of our cement on the Presbyterian house, Philadelphia, caused us considerable loss, and made it necessary to explain to many of our customers why the cement was rejected. You will see by this that, in order for us to retain our trade in this city, and explain why the cement was rejected, that it was not purely a private matter, as Booth, Garrett & Blair would have it.

I have no desire to state anything but facts as they really exist, and furthermore, wish it to be distinctly understood that there is no malicious intent on my part, nor has there been during my whole experience with the architect, Mr. Jos. M. Huston, and the cement testers, Messrs. Booth, Garrett & Blair.

Yours very truly,

(Signed) WM. J. DONALDSON.

In the meantime another letter was received from Booth, Garrett & Blair, saying that they desired to give Mr. Donaldson an opportunity to correct the statement or disavow it in MUNICIPAL ENGINEERING, adding:

If he is not willing to do this, we will obtain permission to publish the facts and furnish them to you, together with a letter from us on the statement which has already appeared. We have already had to call attention to a statement made privately by Mr. Donaldson about this transaction, and you may be interested to know that the Alpha Cement Co., through its president, disavowed any responsibility for statements he may make

Yours respectfully,

[Signed] BOOTH, GARRETT & BLAIR.

A copy of Mr. Donaldson's letter, as given above, was sent to Messrs. Booth, Garrett & Blair, and a copy of the foregoing letter from them was also sent to Mr. Donaldson.

The following reply from Messrs. Booth, Garrett & Blair has been received:

PHILADELPHIA, July 27, 1896.

To the Editor of Municipal Engineering:

Our attention has been called to an article in your July issue entitled "Controversy Over Cement Requirements," in which certain statements are made regarding this firm, and a Mr. Wm. J. Donaldson is stated to hold that we are placing obstructions on cement specifications which are "aimed at the American Portland cement industry." The article is wholly false in its statements, and clearly malicious in intention.

We desire to say in reply to the article in question: (1) That we did not write the specifications for the Presbyterian Board building, and had absolutely no connection with them whatever until the printed requirements were handed us as a guide in making tests. (2) When the high percentage of magnesia developed, we stated frankly to both parties interested, the architect and the cement manufacturers, that we were not prepared to say what percentage of magnesia would be dangerous in this brand of cement. (3) The architect then raised the direct question whether it was necessary to change the specifications. He said he had been assured beforehand that they were correct, the general and sub-contractors had accepted them, and he did not wish to change them unless it was necessary. We replied that it was certainly not necessary to change the specifications, as there was an abundance of cement on the market which would meet the requirements; further, that there was small reason, indeed, for making concessions in favor of cement which tested as irregularly as the lots previously submitted had done. (4) The percentage of magnesia was not 2.6 per cent. nor, as indicated above, was the objection to the cement solely a question of magnesia. We can no doubt secure permission to publish all the facts in extenso, and should be pleased to do this if agreeable to the cement people.

Such are the facts of our connection with this matter. We desire to add, however, that this firm has never issued specifications for cement. In December, 1894, Mr. Lewis, a member of the firm, read specifications for Portland cement before the Engineers' Club of Philadelphia, which limited the magnesia to 2½ per cent. This specification was prepared at that time "for the purpose of inviting discussion and for no other reason," and this statement appears in the heading of the article as printed in the proceedings of the club. At that time, December, 1894, the American cement manufacturers undoubtedly believed they could meet these requirements and discussed them without objection. The magnesia question has not come in our experience as a live issue from that time until this. Just prior to the development of the high magnesia in Alpha cement, the firm prepared a circular suggesting certain standards for cement and among them for a magnesia requirement of 2½ per cent., which by an error was printed 4 per cent. A few copies of these circulars were issued but we have withdrawn them, and are not

prepared to propose definite figures at present for magnesia in cement.

It is necessary to collect the data in regard to our American cements and compare these with European experience and test records before an intelligent opinion can be formed. We doubt very much whether it is possible to fix on a magnesia limit which is equally applicable to all cement, regardless of their origin or method of manufacture, and we doubt also whether anyone in this country is able to formulate, at this time, a really valuable opinion on this subject.

Meantime we can see no reason why an architect should modify entirely practicable specifications for the exclusive benefit of a man who has undertaken to fill a contract for cement without having read the specifications. This is admittedly what Mr. Donaldson did in the case of the Presbyterian Board building. It is conceivable that an architect might even desire to put his building together with sealing wax, gum arabic, or any other cementitious material, and that it would be perfectly practicable for him to make such a requirement in specifications to the utter confounding of Mr. Donaldson, or any other man who might assume that Alpha cement must necessarily be satisfactory.

BOOTH, GARRETT & BLAIR.

Mr. Donaldson, in replying to the communication enclosing a copy of the letter of Booth, Garrett & Blair, asking that he correct or disavow the statement of which they complained, takes "a new tack," to use a fitting sailing expression, by saying that he never gave our representative authority to publish any part of the conversation with him, that he does not wish to have this matter made a personal one with Messrs. Booth, Garrett & Blair; that he does not want Messrs. Booth, Garrett & Blair to think, or anyone else, that he was attacking them personally, and says, "In my former letter to you the facts as stated are correct, but I do not care to have that letter or any of my letters published in your magazine." Mr. Donaldson may not care to do that which is plainly his moral duty, but this magazine, the public and Messrs. Booth, Garrett & Blair are entitled to a correct statement from him. It is regrettable that a courageous sense of right should not prompt this on Mr. Donaldson's part, after having furnished for publication information which needed correction. Mr. Donaldson furnished the information for the original publication in the presence of Mr. Hartranft, notes being taken at the time, for the evident and well understood purpose of publication, and while his statements were broadly personal, there seemed to be no room for doubt as to the truth of so much as appeared in the magazine, though, in view of the later information which we have taken pains to here set forth fully, it seems that this was a mistake, which we regret.

"In reference to what Messrs. Booth, Garrett & Blair say in their letter about the Alpha Portland Cement Co., through its president, disowning responsibility for any statement which I may make," Mr. Donaldson writes, "I wish to state that I never informed the Alpha Portland Cement Co. or its president, until quite recently, that I had written a letter to the chairman of the building committee of the Presbyterian House, to which Messrs. Booth, Garrett & Blair take exception; therefore, when they wrote their letter to the president of the Alpha Co., asking him if his company was responsible for the statement made in that letter, he correctly wrote them that the company was not responsible. The president of the Alpha company told me to-day that when he wrote that letter he did not know what the contents of my letter were to the chairman of the building committee; furthermore, that if I desired the support of the Alpha Portland Cement Co. in this matter or any other matter pertaining to the cement, they will cheerfully give it

to me. I do not see, however, why I should bother the Alpha Portland Cement Co. with matters of this kind, when it is my duty, as general agent of the company, to take charge of such matters and carry them through without any advice or assistance from them; but if I desire their assistance rest assured I will get it. I do not understand why Messrs. Booth, Garrett & Blair should have brought in this matter at all, or have made any mention of it."

THE QUESTION DEPARTMENT.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

MAINTENANCE OF ASPHALT PAVEMENTS IN BUFFALO.

Visiting Buffalo this spring to examine its pavements, I was informed that there were about 200 miles of asphalt streets and that such pavements are there guaranteed for five years, being turned over to the city at the end of that period in good condition. What does it cost the city to keep its asphalt pavements in repair thereafter?

Kansas City Member Street Committee.

This question is of such importance that a full answer with tabulated statistics will be undertaken in a later number of this magazine. The answer must consider the fact that the periods of guarantee have once or twice been extended on a few streets to seven years, also that the street railway companies pay for the maintenance of the portions of the streets they occupy. Another factor, affecting the cost of repairs and one which has very much reduced this cost, is the use of various surface heaters, which remove from but one-fourth to one-half inch of the old asphalt pavement, thus doing away with the method which for many years was the only one in use, namely, cutting out the the worn portion with axes, stripping the asphalt pavement to the concrete below. The cheaper and quicker method of surface heaters or "skimming" came into use about three years ago.

Keeping the above in mind, available statistics show that, during ten years, including 1895, the cost of maintenance per yard per year on all the pavement under maintenance of the city was $.051 per square yard per year. Excluding the streets with light traffic and slight or no repairs, it is interesting to learn that the cost on the streets of Buffalo bearing the real traffic, including those with rails for the same period has been $.074 per square yard per year. These figures for the cost of maintenance in Buffalo will not apply to all cities, but with the improved rapid cheaper methods of maintaining asphalt pavements in constant repair, the above prices, on the whole, represent for most cities, a maximum rate.

TRACKS FOR WAGONS ON MACADAM ROADS.

Are iron tracks, flat or other form, in actual use for ordinary wagons and carriages on any macadam or other road in the United States?

Road Surveyor, Roanoke, Va.

None are known to us. Many experiments have been tried on short sections of roads. A system of flat steel sheets eight inches wide, fastened to wooden stringers under them, were placed through a section of 200 feet of a brick pavement inside one of the gates of the World's Fair at Chicago. It was

not successful because of being attached to wood.

Another system of steel tracks for vehicles, designed to relieve macadam and other roads from the wear of wheels, was exhibited at the Atlanta Exposition. Experiments are in progress in this connection. Three things make wagon track construction very difficult. First, the width of vehicles differ; second, frost makes durable construction on suburban and country roads very expensive; third, records show that two-thirds of the wear from traffic is due to the hoofs of horses, leaving but one-third of the traffic wear to be partly relieved by the introduction of flat or other wagon rails. This indicates that such a construction may not be economical, although at a few places it might prove to advantage.

DISPOSAL OF GARBAGE, ASHES AND STREET SWEEPINGS.

How is the city of New York going to dispose of its refuse? I see by the newspapers that nothing is to be dumped at sea as heretofore.

J. B. B., San Francisco.

After August 1, 1896, New York city will deliver the garbage or kitchen refuse at certain points to the company which has bid the highest price for this portion of the refuse. Ashes will be taken away by another set of city carts and used or sold for filling low ground wherever needed. These ashes will be clean or free from any matter which might decay. The street sweepings are almost pure manure and will be sold regularly at market value. They will be gathered in the carts assigned to that duty.

The householders must have two waste cans and are compelled to put the garbage in one and the ashes in another. The organization of the present model street cleaning department is such that every householder or occupant is notified individually and a record made of the service of the notice. The police and health officers cooperate. The press and public have made the whole method popular.

HORSESHOES FOR ASPHALT PAVEMENT.

What kind of horseshoes should be adopted for horses in a city where there are many asphalt pavements, such as Washington and Buffalo?

S. G. B., New York.

In the above named cities, and many others where asphalt pavements are laid to a large extent, the horses should be shod with flat shoes; that is, shoes without calks, except in winter in cold climates. Horses for pleasure driving and heavy traffic are helped by this kind of shoe, because it eases the action and gives them the full benefit of the elasticity of the asphalt pavement. In all, except icy weather, calks are useless on asphalt, as well as most other pavements.

HOW CEMENT BICYCLE TRACK SHOULD BE LAID.

Please give information as to how cement bicycle tracks are laid; depth of concrete, grade, pitch from outside to inside, and any other information you may have.

G. P. Co.

This question probably refers to a bicycle race track, with several of which we are familiar, none of them, however, of concrete, although such may exist. This is an interesting question. We publish it first in order to ask the writer to state more clearly whether he means a race-track in an oval or other form, or a bicycle path for pleasure, such as extends from Brooklyn to Coney Island, or the bicycle paths called "ribbons" laid

in a few cities, especially New York, along the sides of stone paved streets. They are about five feet wide, next to the curb stones. The Brooklyn path is made of fine grained macadam. The city cycle paths, or "ribbons," are made by removing the stone blocks, filling up the space thus left with two coats, first of a fine asphalt concrete of about three inches thick, laid upon the concrete foundations under the stone pavements. Upon this binder is placed an asphalt pavement surface from two to three inches thick, for the construction must also sustain heavy traffic, which has a tendency to seek it. Any reader of MUNICIPAL ENGINEERING is invited to contribute such information as he will concerning this subject.

A POLITICAL REPORT OF AN INVESTIGATING COMMITTEE.

On the subject of aldermen and other members of what should be the legislative branch of a municipal government, interfering with the executive, technical, or engineer's department of city work, to the loss of much money to the city and taxpayers, and the early necessary reconstruction of the work, the following is interesting and I desire your opinion:

Certain materials were ordered used in connection with public work which the entire engineering force easily detected as worthless, but were overruled by the street committee. The construction failed; an investigating committee was appointed whose report described in the language of an engineer, or other scientific man, is fully covered by the following formula: Ca O 27+H_2 O 73 and no trace of Si O_2. What are your comments?

Consulting Engineer in X.

Some aldermen, and even mayors, go into too much detail and think that the moment they are elected they receive, possibly by special Providence, knowledge which they never before claimed. Street, sewer and other committees constantly forget that their duty is one of general preparation and legislation. Each member, when some one in his family is sick, employs a doctor in whom he has confidence, and trusts him, the same in private architectural and engineering work. But, too often in public work, they follow other methods, to the injury of many and eventually themselves. The well-known saying, "O! religion, what crimes are committed in thy name," could be altered to read, "O! politics, etc." The spirit of the above report was indeed that of partisan politics, possibly combined with money or other "influence," because literally interpreted, that investigation committee employed a combination of lime and water called "whitewash." No member of it had a trace of "sand" in his composition.

KINDS OF STEAM ROLLERS.

Stockton contemplates purchasing a steam roller for macadam. Rollers with three wheels and others with solid drum are offered. Our streets are built with a crown. What kind of roller is used for such work in the municipalities of the east and middle west?

Geo. A. Bidwell, Supt. of Streets, Stockton, Cal.

The important points to be considered are: Is the roller heavy enough? The heavier the better for macadam. Is it well made, reasonably durable and easily repaired? Many other points suggest themselves to the practical man, who of course is the one to be trusted in such matters.

The number of cylinders, or roller wheels, makes little difference, because all road rollers are constructed after much thought and with care. The latest class of steam rollers have one large solid main drum, which does the real work; also, a leading or steering drum, divided into two parts, generally touching each other, free to revolve at separate speeds when turning corners. On other rollers we do

not find a large drum, but in its place two smaller ones, one on each side. Purchase the best roller, all things considered, without regard to the question of how many cylinders or rollers there are.

The usual kind met with on macadam or telford road construction in Europe and the United States has two large driving wheels, one on each side. These sustain the greatest part of the weight. It is well to remember that temporary screw studs, or spikes, can be screwed into the perifery of the two large wheels. They serve to pick or loosen the surface of old macadam when it is necessary to add new on top and have it bind together with the old roadway below.

WOOD PAVEMENT IN LONDON.

When was the first wood pavement laid in London, and on what street? What is its average life? *H. K. B., Boston.*

The first attempts at all successful were in 1839 on the old Bailey street. The average life can not be given, first, because the traffic on the streets of London varies in number and weight of vehicles; second, because the wood pavement is repaired on many streets every week, and on a few almost daily. Under heavy traffic, the wood blocks have been once entirely replaced in about four years. This continuous repair on three streets of the heaviest traffic became impossible at the end of nine years, when the concrete foundation was put in order and the entire wood pavement replaced. On streets of the least traffic, it is generally stated that the entire surface has been once replaced little by little in seven years. At the end of eleven the foundation must be laid bare and repaired, and the entire surface, of course, replaced. The expense is very great, about twice that which is paid for asphalt and granite maintained in good order during equal periods of time, at the expiration of which the pavements are, of course, in good order. They are retained at large expense on several important streets, as they are pleasant to ride over.

AVERAGE COST OF LAYING BRICK PAVEMENT.

What is the average cost of laying vitrified brick on a concrete foundation? *J. N., St. Louis.*

We take this question to mean not the cost of laying the pavement, but of a completed pavement. It is not possible to give a reliable average cost which would apply to all cities, because the specifications differ radically and the local conditions also, in such a way that if the prices in each of many different cities were added together and divided by the number of cities, the result would be misleading.

Assuming that the cost of the pavement includes about eleven inches (the depth of the brick, sand, and six inches of concrete), and that the freight would be about one-fourth the cost of the brick; also, that the pavement is guaranteed for five years, and that the traffic estimated in advance, governs the price; bearing these things in mind, it is safe to say that, for a light or medium traffic, an average price for such a pavement would be about that of Buffalo, $2.75 per square yard. Under sharp competition, on five inches of concrete, some resident streets of Brooklyn have obtained good work for $2.55 per square yard. The cost at points nearer the source of supply would be lower.

If the joints of the bricks are filled with specially prepared pitch, asphalt, or a combination of these,

the rumbling of the brick pavements on concrete, with joints filled with Portland cement, is lessened, adding about eleven cents, however, to the cost.

Some cities, as indicated in vol. 10, page 236, pay less for their brick pavements, ranging from $1.40 upward, and still cheaper prices prevail in towns and small cities. It must be remembered, however, that in many places grading and certain accessory work is paid for separately from the price of the pavement.

The above prices are given as the result of records and inspection in places where the class of work has been such as to warrant being used in this connection.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

VITRIFIED BRICK FOR THE INNER RING OF SEWERS.

Can you give the results of any experience with the use of vitrified brick for the inner ring of sewers? *G. W. C.*

It is a common experience that the bottoms of sewers which are on steep gradients wear out too rapidly, soft bricks disintegrating and giving opportunity for water to get under the first and even the second course, thus producing holes in the bottom which require prompt repair or a collapse of the sewer follows. It has often been suggested in the last few years that vitrified brick be used for the inverts and some manufacturers have offered seconds at prices almost equivalent to those for good sewer bricks. A trial has demonstrated their value in the locations mentioned. Seconds, however, can not be used indiscriminately but they must be culled, or carefully fitted, to give a smooth surface, in order to secure the best results. The mortar should be mixed with Portland cement, and as small a joint as possible be made, as it is difficult under the best conditions to make the mortar stick to the smooth sides of the brick, and the space between brick on the invert must be as small as possible, so that there will be little or no tendency to undermine the brick by water getting under them. From one-third the circumference of the sewer to one-half, usually the former, is sufficient, as the wear comes principally on the bottom third. The vitrified brick will not work well in the arch, as the cohesion of mortar and brick is not sufficient to keep the arch in place should any accident or settlement throw it out of place, and a collapse of the inner ring would follow a comparatively slight disturbance of the brick work. Where the sewer gradient is nearly flat and the velocity of flow of sewage is low, the vitrified brick are a useless expense, as good sewer brick will last indefinitely.

EFFECT OF HEAT ON JOINTS OF EXPOSED WATER MAINS.

Will heat have any effect on the joints of water mains which have been laid for five or six weeks without being covered? *William Gollmer, Brockton, Mass.*

The expansion of lead is nearly three times as great as that of iron and, theoretically, the effect of the heating and cooling of the pipe would be to diminish the tightness of the joints. For small pipes this effect would be small and in five or six weeks would not seriously affect the tightness of the joints if they were properly made in the first place. The larger the pipe the greater the effect, and the greater the pressure the more liability to blowing out a joint. Unless the pressure is very great or the pipe is very large, if you take the precaution to thoroughly drive in the lead again, you need fear no difficulty from the cause mentioned. If the pipe is small and the pressure low this precaution will be unnecessary. If the pipe is full of water constantly the temperatures will remain nearly constant and there will be less chance for trouble.

BY WAY OF COMMENT.

Plumbing Inspection.

Mr. William Eccles, writing on vitrified clay pipe for house drains under buildings, is of opinion that they should be prohibited as dangerous, even within the lot line. The reasons he gives are the inaccuracy in size and shape, which make it almost impossible to lay the pipe to accommodate the irregularity without leaving large joints to be filled with cement, which is usually poor in quality and mixed with poor sand or dirt; probability of disturbing the joint before the cement has set; liability of settlement in soft soil; large number of joints; unskilled manner in which pipes are laid, altered or repaired; bad gradients; lack of proper curves for changes in direction; bad joints and broken hubs; cement inside of pipes; careless patching of holes cut for cleaning out stoppages; holes left open in sewer.

Similar objections may be made to the use of iron pipe if a poor quality of pipe is used; bends are not used for changes in direction; joints are not well filled; lead or oakum is permitted to project into the pipe; joints are not well tamped; joints are filled with oakum and putty or clay; pipe with air holes or thin walls is used; connections with lead pipes are stuffed with rags or putty; holes are punched in pipe for connections and improperly covered, and the like.

The advantages in favor of iron pipe, cast or wrought, under buildings are so great that the vitrified clay pipe should never be used in that connection, but the real trouble in Mr. Eccles' case is with the lack of proper control of the laying of pipe and inspection of the same by a proper authority, rather than with the kind of material used.

The licensing of plumbers should be under the control of an official or board whose duty it shall be to determine the qualifications of applicants for license and refuse those who are not competent or not responsible persons. All plumbing should be under strict inspection of city authority. The local board of health is frequently put in charge of the regulation and inspection of plumbing, but it is not usually the most competent authority in the matter. It is seldom that there is a member of the board who is an expert in matters of plumbing and house drainage, or even has a speaking acquaintance with the practical side of the subject. The person in the city government who is most likely to be familiar with the subject, and who by his training and knowledge can easiest inform himself, if ignorant, is usually the city engineer. He should have a large share in the preparation of rules and regulations for plumbing work, and the practical enforcement of the rules should be under his direction. The common requirement that the inspector shall be a plumber out of a job is very objectionable in theory and nearly always in practice, as plumb-

ers out of a job are likely to be far from the best workmen. Plumbers, especially of the grade likely to seek appointment, while possibly fair inspectors of workmanship, are very seldom competent inspectors of the design. A full set of rules and regulations laying down the details of good plumbing practice and competent inspectors with good judgment and sufficient latitude allowed them to secure full compliance with the spirit of the law in all circumstances, will obviate the evils enumerated by Mr. Eccles and others that may be given as attendant upon that and other systems of plumbing. A change of material or system without improvement in plan and in workmanship will not do away with these evils, but may engender a false sense of security which will be of more damage than the poorer material and system if well constructed in its details.

The Cost of Maintenance of Water-Works.

A company proposes to bring to Philadelphia filtered Delaware river water and deliver it to the city reservoirs for 60 per cent. of the city's revenues from water rents, the city to have full charge of the distribution as at present. The proposed contract would be for fifty years, the city to have the privilege of purchasing at any time after ten years at cost and ten per cent. interest per annum, less any dividends that may have been declared. A line with a capacity of 175,000,000 gallons a day would be constructed the first year from Trenton, thirty-five miles from Philadelphia, to a point near Holmesburg, where a filtering plant and a 150,000,000 gallon reservoir would be erected. The city's reservoirs would be supplied from this point by gravity and by pumping, as necessary. Later, within three years, if desired, another conduit, with a capacity of 175,000,000 gallons would be brought from Easton, eighty miles away, thus giving a total capacity of 350,000,000 gallons a day. The advantages claimed are a first-class filtered water supply, most of the present supply being inferior to the Delaware and not properly purified; unlimited quantity, not obtainable from the present sources; early completion of works; moderate annual cost for the supply, and no cost whatever for construction, but with privilege of purchase. The company has nothing to do with the distribution.

The income of the city from water rents last year was $2,782,863.10. If the consumption per day is assumed at 150,000,000 gallons, this would give the city a revenue of about $50 per million gallons per day. Under the company's proposition $30 per million gallons would be paid for delivering the water to the city's reservoirs and $20 per 1,000,000 gallons would be left for paying the expense of the distribution. Whether this is an equitable division of the proceeds of the water rents can only be determined by a careful consideration of the amounts

of money necessary for construction of the distributing system, and for construction of the supply system, and of the amounts of money necessary for the maintenance of the two systems. It should be easy to arrive at the cost to date of the distributing system, and to make an estimate of the additional cost to the date of beginning the new supply. Less accurate estimates of the cost of the new supply system can be made. The cost of maintenance of the distribution system can be estimated from the cost for recent years, and an approximate estimate of the cost of maintenance of the new supply system can be made. The interest on the cost plus the cost of maintenance in each case should give a close approximation to the relative amounts that should be received by the company and by the city. Or the contract might be made on this basis, exact percentage for each to be determined when the construction is completed and the actual cost of the new supply system and the cost of maintenance determined. The percentage to each might vary from year to year, as the relative cost of maintenance of the two systems varied. In the case of Milwaukee the original cost of the distribution system is 65 per cent. and of supply is 35 per cent. of the total cost. The cost of maintenance of the pumping stations and reservoirs is nearly 45 per cent. and of the distribution 55 per cent. of the total cost of maintenance. In this case, therefore, the company should receive approximately 40 per cent. and the city 60 per cent. of the revenues, the reverse of the company's proposition in Philadelphia. Different conditions may greatly change the relative proportions for the two systems, and the percentages should be determined for the particular case.

Some Sewerage Problems. The sewage of the city of Worcester, Mass., is very large in amount in proportion to the flow of water in the Blackstone river into which it is discharged, and years ago produced an unbearable nuisance. By act of legislature the city was required to purify its sewage before discharging it into the river, and constructed chemical precipitation works which were first put into use in 1890. These works have been enlarged with the increase in flow of sewage until they are now becoming quite burdensome in cost. The amount of polluted water to be treated is greater than the amount of sewage proper, because Mill brook, the outlet of North pond, is used as the main sewer for a large part of the city, thus increasing the flow through the disposal works by an amount of originally clean water, which amount depends upon the flow from North pond. It has been proposed to carry the discharge from North pond in a separate channel; to divide the channel of Mill brook into three parts, the clean water to flow in the middle channel and the sewage in the two outer channels, overflowing in-

to the middle channel with heavy rainfalls; or to put intercepters in the nearest streets each side of the brook, thus removing the sewage from the stream entirely. All of these methods would be expensive.

The latest proposition is a plan by the city engineer, Mr. F. A. McClure, to revise the entire sewer plan and make separate systems for the storm water and the sewage. In new districts the two systems would be constructed as needed; in some of the older parts of the city the present sewers would be used as storm water sewers, all house connections, except for roof water, would be cut off, and an entirely new system for house connections only would be constructed; in other parts the present sewers would be used for house connections only, and all connections admitting storm water from roofs, yards or streets would be cut off and carried to a new storm water system to be constructed.

In a report on the subject Mr. McClure gives details of the proposed changes. He states in his summary that there are ninety-one miles of sewers. Of these thirty-eight miles can be used for carrying sewage proper, and the remainder can be used for the disposal of surface water. A complete separation of the existing systems will require fifty-three miles of new construction, varying in size from 60-inch brick sewers to small pipes, about nine and one-half miles being brick and forty-three and one-half miles pipe. The estimated cost of the entire remodeling of the system is $892,739, but it is not stated whether the cost of remodeling the house connections is included. This plan would reduce the amount of sewage to be treated to a minimum.

Professor Kinnicutt, of Worcester Polytechnic Institute, who has had a connection with the study of the sewerage problem of the city for years, doubts the propriety of adopting the plans without the most careful consideration and full proof of its absolute necessity. He states in an interview in the Worcester *Gazette* that the present dry weather sewage of the city, including Mill brook, amounts to about 16,000,000 gallons a day, often running as high as 30,000,000 gallons during heavy showers and storms, and that the city engineer's plan would reduce the amount to 7,000,000 gallons a day. It is evident that Mill brook should be separated from the sewage, but he wishes several questions answered before he is prepared to say whether he would advise the adoption of the separate system. These questions are:

How large a fall of rain causes an overflow of sewage into the Blackstone?

How large is this overflow with different amounts of rainfall?

How many days in each year is there an overflow, and the amounts?

How many hours during the day when there is an overflow does the overflow continue?

What is the volume of the Blackstone river under the above conditions?

What would be the exact effect of separating only Mill brook from the sewer system?

What would be the amount of overflow of sewage, if besides cutting off Mill brook the separate system was introduced only in certain portions of the city, leaving districts that could be named, as they are at the present time, with the combined system?

There is, further, one serious difficulty to be encountered in the separation of storm water from sewage proper, and that is a question of street washings. Street washings, especially from paved streets, after sudden showers, or during the first hours of a storm, are considered as most offensive sewage. What is to be done with them? Can they be emptied into the Blackstone river without causing any trouble?

The case would seem to be one to be seriously considered on the line of investigation given in the article on "Intercepting and Relief Sewers" in this number of MUNICIPAL ENGINEERING, as the flow in Blackstone river is very small and the first street washings become very offensive. Any system of purification must, in the opinion of many experts, take account of this most seriously polluted street drainage as well as of the sewage. The case is further complicated by the peculiar character of much of the very large amount of polluted drainage from the many factories in the city. If the purification is not satisfactory to the state authorities it must be made so, and it would be a serious matter to discover after the construction of the separate system that the street drainage, or at least the early portions of it, still pollute the stream beyond the limit permissible.

The purification of the sewage of a large city is no small task, and will be very expensive under the best conditions. It, therefore, behooves the engineers to reduce the flow to a minimum, but not by shutting out of the treatment process seriously polluted drainage, though of somewhat different character from house sewage.

The Milwaukee Water-works. The city engineer of Milwaukee, Mr. G. H. Benzenberg, reports the completion of the new intake tunnel for the city water-works at a total cost of $603,844.19. The contract was awarded to Shailer & Schniglau on June 30, 1890, who had done much successful work of this kind, but they were unable to successfully prosecute this undertaking with the many difficulties attending it, and their contract was cancelled October 17, 1893. It was the opinion of many that the work could not be completed, but the city engineer and the board of public works had confidence in their ability to do the work and proceeded with it, and on September 25, 1895, the new intake was opened and the old one permanently closed. The water supply is now taken from a point 46 feet below the surface, 13 feet above the bottom of the lake and 8,200 feet from the lake shore, and its purity and perfect physical condition fully justify the heavy expense. The original estimate was exceeded by 20 per cent., which is not excessive when the nature of the unforeseen difficulties met with is considered. The work consists of a brick tunnel 7½ feet in diameter, extending 3,200 feet from the shaft on shore at the pumping

station to a shaft in the lake. Each end of this line was in a hard clay, almost like rock, but water bearing strata were crossed on the way and it became necessary to change the alignment and the elevation of the tunnel to get around obstacles, and to use many special forms of construction. Most of this difficult work was done by Mr. Benzenberg after the contract with Shailer & Schniglau was cancelled. The tunnel was about 140 feet below the lake surface. From the lake crib two lines of cast iron pipe were laid in a trench dredged in the lake bottom 5,000 feet out into the lake to a submerged intake. These pipes were each 60 inches in diameter.

The intake tunnel for the new St. Louis water-works is 7 feet in diameter and 1,555 feet from shore to the inlet tower, in solid rock with brick lining, and 90 feet below the surface. The contract was let in January, 1890. It was believed that with the easier material found at the two ends of the Milwaukee tunnel that it would be completed before the St. Louis tunnel, but no difficulties were found at St. Louis, and the work progressed with fair speed and was completed ready for use in about two years under the original well prepared plans, while the Milwaukee tunnel took about five years, and called for the exercise of great engineering abilities in overcoming the many difficulties arising from day to day which could not be foreseen and provided for in the original plans.

The total cost of the Milwaukee water-works to January, 1896, was $4,633,435.39. The water is pumped from Lake Michigan. The cost of construction is divided as follows :

Reservoir	$152,988.78
Pumping stations and pumps	920,199.91
Pipe distribution system	2,765,750.16
Auxiliary and new tunnel intake	627,028.79
North street bridge	88,779.08
Engineering salaries, instruments, etc	78,688.67

The works have paid all charges for maintenance, amounting to over $2,000,000 since 1874, all charges for interest, amounting to nearly $1,500,000, have paid $1,147,250 of the bonded indebtedness and have paid into the general city funds $215,000, besides furnishing much water free for various city uses. The rates are not excessive, and it is clear that the city ownership is a vast benefit to the public. The bonded indebtedness is now $1,600,000, which can be paid off at the present rate in about ten years, or in less time if payments to the general fund are stopped. If further large payments for extensions and renewals are not required, the water rates can be reduced at any time with pecuniary advantage to water users. Part of the expense of new water mains is assessed upon abutting property as their location is a direct benefit thereto. The city is charged for fire hydants, for street sprinkling, and other rates amounting to nearly $125,000 a year, the collection of which is not very carefully

made according to the reports, over $112,000 being unpaid at the end of 1895, which "will most likely always remain on the books as unpaid." No general tax is levied for interest or sinking fund, but on the contrary the general tax is reduced by payments from the water receipts to the general city funds.

It would seem that the small amount charged to the city for general purposes should be considered a proper city charge, and that the benefit of the good management of the works and their high earning capacity should accrue to the consumers of water, by a lowering of rates, rather than to the city at large, or at least that the benefit should be divided between the city at large and the consumers. The temptation to keep the rates constant and diminish the general tax rate is great, however, and when the use of water is almost universal, the effect is practically the same upon the taxpayers.

Uniform Methods of Reporting the Cost of Engineering.

The report of the board of public works of the city of Milwaukee gives full details of the work under its charge, most of them being well classified and easy to find. For making comparisons with other cities two or three desirable items are lacking. One of them is the cost of the engineering department. It would be of great value to know the cost of doing such excellent work as is evidenced by the reports from the city engineer. The cost of engineering is very different in different cities, and there is too often an attempt to reduce the cost below that for which good work can be done, in order to make a good showing before the taxpayers. This is done by reducing salaries, by charging all possible items to other funds, by omitting the cost of inspection. A uniform method of reporting the cost of engineering would facilitate comparisons and be of value to all city engineers. It is suggested that this form give the cost of city engineer, assistant engineers, field and office men, inspectors and miscellaneous expenses, each being divided into classes if desired. A full statement of work done by the department should accompany. The form adopted by Indianapolis is, perhaps, as full as is necessary. Other points that are omitted in the Milwaukee report are the widths of sidewalk and street pavements and the lengths of the various kinds. Perhaps this last item is omitted because nearly all the pavement in the city is cedar block, asphalt and brick, having been laid first in 1895, and invidious comparisons are not invited by tables giving details of lengths. According to property-owners who object to paying for asphalt that pavement is still an experiment, the twenty years of use in other cities counting for nothing in demonstrating the fitness of that material for street paving.

Waste of Water by Automatic Flush Tanks.

The matter of automatic flush tanks as users of water is under discusion in the city of Indianapolis. The facts given in the ques-

tion department of MUNICIPAL ENGINEERING last month should throw much light on this subject. Doubtless most cities have permitted the tanks to go without regulation until the amount of water used becomes excessive. With tanks of good design the amount of water to be used is largely a matter of judgment as to the amount necessary to keep the sewer clean, the regulation of the flow being easy when the amount desired is determined. Tanks of poor design which require much water or which easily get out of order should be replaced by better ones. The complaint of water-works companies and officials that the flush tanks are great water wasters is certainly well founded, but the fault does not lie in the tanks, but in the carelessness with which they are selected, constructed and maintained. As to the comparative merits of automatic flush tanks and flushing with hose, there can be no controversy on the small pipes at the upper ends of systems, especially in districts where there are long periods of dry weather. For *equal service*, the flush tanks are probably much more economical than sewer gangs furnished with hose, if water is paid for at a reasonable rate for both methods, and the tanks are properly regulated. As stated last month 2,000 gallons a day is the maximum necessary per day for each tank, and in perhaps a majority of the tanks of a sewer system the amount can be reduced to 500 gallons a day.

Milwaukee's Municipal System. The Board of Public Works of Milwaukee consists of four members, the city engineer being *ex officio* chairman. This is a feature that should be adopted by all cities, care being taken to secure as city engineer a man fully qualified. When he is found he should be kept in office. The city of Milwaukee has been fortunate in its engineer, and appreciates its good fortune by retaining him in office. All public improvements are carried on by the board, except the park system, including sewers, street and sidewalk paving, water-works, bridges, city buildings, school-houses, library, natatoriums, docks and river improvements, street sprinkling and cleaning. All seem to be nearly as well managed as the water-works, mention of which is made elsewhere. About $2,000,000 was spent for construction under the direction of the board during the year 1895. The average cost of asphalt pavement was $2.01 a square yard, brick pavement $1.40 a square yard, granite block $2.45 a square yard, stone curb 46 cents a lineal foot, cement curb 80 cents a lineal foot, cement sidewalk 90 cents a lineal foot, width not given. Street sweeping costs 29 cents per 10,000 square feet each time for wood pavement, 32 cents for stone. The new city hall is completed at a cost of $1,000,000, and a new public library building is begun which will cost $500,000. The board maintains two natatoriums at an annual expense of $9,300, which

had a total attendance, male and female, of nearly 400,000 persons during 1895. A new viaduct over railway tracks, costing $299,000, has just been completed, of which the railroad paid $125,000. With the exception of street pavements, the city is fully up with the best modern practice, and presents many points worthy of emulation by other cities. The first modern pavements were laid in 1895, and will doubtless be followed rapidly by others. B.

CURRENT INFORMATION

ASPHALT PATENT LITIGATION.

Another step has been taken in the long-pending litigation of W. W. Averell vs. A. L. Barber, by Judge Lawrence of the New York supreme court, rendering pro forma judgment confirming the report of the referee, George B. Morris, filed last March, awarding the plaintiff $476,197.18 of profits claimed to be due under the articles of incorporation of the American Asphalt Company, in which Averell and Barber were jointly interested prior to the formation of the Barber Asphalt Paving Company. Judge Lawrence, in confirming the referee's report by pro forma judgment, stated that he did this for the purpose of appeal. The history of the litigation was reviewed in the April number of Municipal Engineering at the time of the filing of the referee's report. The suit is against Mr. Barber individually, whose attorneys have appealed to the Appellate Supreme Court. Referring to current newspaper reports involving the Barber Asphalt Paving Company in the case, Col. F. V. Greene, president of that company, makes the following statement:

"So far from Averell having a judgment against the Barber Asphalt Paving Company, this company has a judgment against him in this identical case, which judgment is final, and was given with costs, which were recovered against Averell after tedious supplementary proceedings. The language of the court in its decision is that the Barber Asphalt Paving Company has not done anything in the premises contrary to equity and good conscience.

"So far as the litigation concerns Mr. A. L. Barber personally, the judgment against him has been appealed. Gen. Averell sues not in his own behalf, but as a minority stockholder in the American Asphalt Paving Company for the benefit of himself and the other stockholders. The majority of this stock has long been owned by the Barber Asphalt Paving Company, so that, in case the present report against Mr. Barber should be sustained, the greater part of the recovery would belong to the Barber Asphalt Paving Company. It is significant that none of the stockholders, of whom there are many, has joined him during the thirteen years of this litigation.

"The suit was originally brought against both the Barber Asphalt Paving Company and Mr. Barber. As the Barber company, on appeal, had judgment with costs, it was impossible for the referee to proceed against that company. He therefore selected certain contracts in the city of Buffalo (the only ones of their kind) which had been taken in the name of A. L. Barber personally. In point of fact, these contracts were executed by the Barber Asphalt Paving Company for its sole account and profit and every dollar received under them was paid to the Barber company and not to Mr. Barber.

"When these facts are brought before the appellate court, on appeal, a reversal of the referee's finding against Mr. Barber must follow inevitably from the decision of the general term rendered since the order of reference was first made."

BROOKLYN'S NEW MUNICIPAL LABORATORY.

A new chemical laboratory for analyzing asphalt has been in operation in the municipal department building in Brooklyn since the beginning of May. The new institution was established by Nelson P. Lewis, engineer in charge of the bureau of street construction and maintenance. The laboratory is in charge of Chemist W. Horner Broadhurst. When a street is being paved specimens of the material are cut out and taken to the laboratory, where each one is carefully

labeled and a record made regarding its chemical analysis, the place from where it is taken, the time, etc. This shows the character of the work done, and will enable the engineer to determine in the future, by comparison, what changes the asphalt has undergone by reason of weather, wear, and changes of temperature, and a later analysis will show any change the material has undergone while lying in the laboratory without being subject to wear and tear. Analyses are also made of the material used by the contractor to ascertain if it comes up to the standard, and of the cement used in the concrete foundation on which the asphalt is being laid. Experiments made by Mr. Broadhurst show that the average analyses of Trinidad lake refined asphalt run about as follows: Petrolene, 40.01; asphaltene, 15.78; total bitumen, 55.79; organic matter, non-bitumen, 8.05; mineral matter, 36.16; matter volatile at 400 degrees Fahrenheit, in ten hours, 3.15; softening point, 190 degrees; temperature of flow, 206 degrees; specific gravity, 1.3857.

In the case of pavement samples these results are reached: Matter soluble in bisulphid of carbon, 8.50; insoluble residue, 91.50; fire test, 560 degrees. The acidity of caustic potash is also determined.

Sand is used in forming the asphalt compound laid as a pavement, and this also is subject to chemical analysis, the result being thus: Silica, 97.70; alumina, 0.50; sesquioxide of iron, 1.55; lime, 0.11; magnesia, a trace.

Mr. Lewis says of the new work:

"It seems to me that this is the only way in which we can keep on the track of the asphalt contractors. Formerly we were very much at their mercy, but now we are in a position to know accurately what they are doing. We have only made a beginning as yet, but we are going to have a complete record as to every block in the city paved with asphalt. The number of samples will, of course, increase rapidly, and before long we shall have to have more room to stow them away. The study of asphalt is curious and interesting. Our analyses cover not only the refined asphalt before it is mixed with sand, but the completed paving material, including both the binder and the top course.

"Mr. Broadhurst has taken hold of the matter with earnestness, and seems thoroughly capable. Some of the methods he is employing are new, and they give good results. We are able, by means of this chemical laboratory to place ourselves on even terms with the contractors and know positively whether their work comes up to the specifications. The fact that we are thus keeping a close watch on them will have a good effect. Other cities have not engaged in this work to any extent yet, so far as I know, although they have done considerable in the way of analyzing asphalt in Toronto. Some of the specimens examined here show that the work is not what it ought to be, and, consequently, in these cases the contractors will be compelled to do their work over again. The work of our inspectors is not lessened by reason of what is done in the laboratory, but the laboratory work supplements in the most important way what the inspectors do in keeping watch of the contractors engaged in laying asphalt pavements."

SUGGESTIONS FOR STREET CLEANING SOCIETIES.

Street cleaning societies, composed of women in some instances, and of school children in others, are being formed in many cities. Their purpose, as a rule, is to stimulate civic pride, to discourage the littering of streets with papers or refuse of any kind, to build up sentiment in favor of keeping streets as clean as possible, and, where necessary, to report for prosecution people who cannot be reached by persuasive influences. Recently the girls in some of the private and public schools of Utica, N. Y., formed such an organization, and, in the beginning of their work, one of the leaders wrote Mrs. Waring, wife of the street cleaning commissioner of New York, advising her of their purpose and asking for suggestions. Mrs. Waring replied in a letter of remarkable interest to all who appreciate clean streets, as follows:

My Dear Girls—I do not say "my dear young ladies," for I want to meet you on an informal footing.

I can not begin to tell you how proud I was of your letters, and though I must admit that you might have addressed yourselves to a number of prominent and efficient women who could have given you far more valuable suggestions than I can, yet your choice could not have fallen on one who is more deeply interested in the subject of clean streets.

I sometimes fear that I shall forget the color of the sky above or lose my appreciation for handsome houses, beautiful gardens, or gorgeous equipages, and even run the risk of being accused to have passed my dearest friends unnoticed as I strolled along examining the condition of the streets. But how could I help it? To me, a clean, tidy street is the essential framework for all else. A fine residence or public building cannot be imposing if the curbstone is lined with a fringe of unsightly paper scraps, banana peels, a cast-off hat, and old shoe, an umbrella frame and a tin can. Such disfiguring decorations would mar the beauty of a Panthean.

When I came to New York, just fourteen months ago, as I drove through the streets the sight of piles of garbage, rubbish of all kinds, over-filled ash barrels,

garbage cans, old mattresses by the dozens lining the curbstones, made my heart sink within me. How was this baleful, awful practice ever going to be cured? To a doubting woman this seemed indeed an impossible task for any mortal man to undertake. You all know the story how Hercules cleaned the Augean stables? But he was a demi-god, and he had a river to help him. Col. Waring has no supernatural aids, and the river only runs through his streets when it rains hard. He had courage, patience, hard work and a steady determination to clean the streets of New York or die in the attempt. These accomplished the end, and the streets of New York are now clean.

Public interest was soon aroused and began to reach over the entire city. The millionaire living on Fifth avenue felt the influence almost as much as did the poor denizens of Mulberry Bend and Hester-st.

Then the children began to take the infection, and the girls and boys of the East Side tenement district, mainly of German and Polish extraction, all belonging to the lower walks of life, were led to form "The Juvenile Street Cleaning League." This was almost immediately followed by the "Substitute Street Cleaning League." The houses of these children are in the heart of the most densely populated district in the world. They were soon made to see that clean streets meant health, prosperity, self-respect and happiness. As soon as they were regularly arranged Col. Warring was invited to address them. I went with him to one of their meetings, where 700 girls and boys were gathered together. Their enthusiasm was unbounded. He told them among other things that cleanliness was catching, that a clean street would make a dirty sidewalk ashamed of its filth, and that the spirit of cleanliness once started would creep into the alley-ways and through the hallways and up the stairs into very living room. The children grasped this idea quickly. These leagues are doing excellent work. Last week badges and certificates were presented to about seventy-five boys; these insignia gave them a certain amount of authority with sweepers and people, and they were as proud of them as a Frenchman is of his cross of the Legion d'Honneur. Each league has its officers, president, secretary and others. Each member makes a monthly or weekly report, showing how many housekeepers or janitors they had interviewed during that time for over-filling garbage or ash receptacles, how many persons they had remonstrated with for throwing papers or other rubbiish into the streets. It is remarkable how much good is done by these juveniles. Their example is being followed everywhere, not alone in this city. I read this morning that Boston had just formed its first "Juvenile Street Cleaning League."

Now, my dear girls, all you have to do is to band together, take some appropriate name, elect your officers and begin work with will. Don't spare anybody Dont' be afraid to go up to the president of these United States himself, if you see him throw anything into your streets, and touching him lightly on the arm, ask him beseechingly please not to do that again. I always found the pleading, imploring tone the most effective. By all means get the boys to join you; they will feel so proud and chivalrous to be able to be of help to the girls.

Remember never to lose your nethusiasm for the good work, that alone will save its novelty and keep it from dying out, as so many other things do which are begun with a great flourish and blare of trumpet.

I love all girls and boys in general, but particularly those who have a natural civic pride, a love for their native town, and an ambition to see the dear home place stand out as a model of beauty and cleanliness, something to be proud of and to point to, saying: This is my town, my native town.

Nothing will give me greater pleasure than to hear of you having organized and begun your work; and I ask you to report to me as to your progress just as often as you may find time; and if anything I have told you may tend to prove a living inspiration amongst you, I shall then dare to claim you in the future as my "Utica League of Young Helpers."

Always most cordially yours,
LOUISE WARING.

LIABILITY FOR AN ENGINEER'S MISTAKE.

The case of the Western Paving and Supply Company against the city of Indianapolis was decided June 29 by Judge McMaster against the paving company. The suit grew out of an error made by H. A. Mansfield, city engineer, in 1891. Relying upon the specifications of the city engineer, which showed the marginal stones along the street car tracks to be 1,150 feet, the company divided the total amount of its bid by 1,150 to get the amount for a foot, which was $5.12. It was found, when a settlement was made and the assessments levied against the property-owners, that a mistake of 200 feet had been made in the city engineer's estimates, and that the pavement was only 950 feet, which resulted in a loss to the company of $849. The city contended that the estimates of the amount of work, distances, etc., were made by the city merely for the convenience of bidders, but were not guaranteed to be absolutely correct in any way; that the bidders should know that the distances and amounts are correct and not depend upon the engineer's estimates. The city's demurrer to the complaint was sustained by Judge McMaster.

SUITS OF TWO CONTRACTING FIRMS

The supreme court of Michigan has affirmed the cases of Laidlaw vs. city of Detroit and the Talbott Paving Company

vs. the city of Detroit. The Laidlaw suit was brought because the city compelled them to forfeit $25 for twenty-eight days beyond the time set for the completion of a paving contract. The court decided against the plaintiff. The Talbott Paving Company sued to recover damages on the ground that the council did not award a paving contract to it, although its bid was lower than the successful bidder. This suit was also decided against the plaintiff.

AGAINST CONVICT WORK ON ROADS.

The Indiana commission appointed by the last legislature to investigate the feasibility of working convicts on the public highways has decided that the plan is not practicable. The working of convicts would give them employment only six months out of the year, leaving them idle the remainder of the time, and this would interfere with contract work, because contractors demand the entire time of the convicts. The expense of caring for the convicts while at work would also be very heavy.

TREES AS A SUPPORT FOR A BRIDGE.

The old wooden bridge which crosses Cerritos creek on the stage road between San Mateo and Pescadero, Cal., is built entirely of the trunks of native redwood trees. It was put up in 1858, and although it has been in constant use it is still in a fair state of preservation. A slight swagger at the north end is said to be the only effect of its long years of service. The enormous hight of the bridge is the most striking thing in its appearance. The center span crosses the creek ninety feet above the water. How the trees were put in position is not known, for there is no one in the neighborhood who remembers when the bridge was put up. There are seventy upright supports in the bridge which seems to have stood on end entirely by the use of ropes, pulleys and muscle; those in the center of the bridge are the highest and the others get shorter as they climb the bank on either side. Few braces are used, giving the appearance of a series of straight poles reaching across the ravine. Stages do not cross on the bridge now, but it is used regularly by foot passengers and small vehicles.

EFFICIENT STREET CLEANING IN NEW YORK.

The efficiency of the street cleaning department in New York City was practically demonstrated to the citizens on the morning after the Fourth of July, when they found that the streets of the city had been well cleaned during the few hours left between an enthusiastic celebration and morning. Well-merited tributes of praise were expressed regarding Street Commissioner Waring and his forces.

LIABILITY FOR REPAIR OF PAVEMENTS.

The question was recently raised in Denver as to whether the Colorado paving company was required, under its contract to repair asphalt pavements damaged by leaking steam and gas pipes. City Attorney Williams, in a letter to President Monash of the board of public works, held that the company was required, during the period of its guarantee, to make repairs necessitated by defects and ordinary wear, but it could not be required to do this work where the defective condition was caused by other companies or corporations using the street.

ASPHALT ON FIFTH-AVE.

Fifth-ave., the famous street of New York, is to be paved with asphalt. There has been agitation for a long time in favor of taking up the granite block pavement on the avenue, on account of its noise and roughness, and replacing it with the pavement best suited to its requirements. There has been much discussion as to the material and methods that should be adopted. Col. North, the water purveyor, who has charge of the street paving of the city, in a recent report, favored wood block, laid somewhat similar to such pavements in London and Paris. After full consideration of the matter, however, the board has decided in favor of asphalt, and the avenue will be paved with this material from Ninth to Fifty-ninth-sts, a distance of about two miles and a half, embracing 60,000 square yards. Before beginning the construction of the pavement, however, a sewer will be built in the street, and gas and water mains will be relaid in proper sizes, so that reopening of the street will not be necessary.

The board of health, in concurring in the decision, says that asphalt paving in

New York has reduced the death rate. The press of New York commends the selection and urges the further rapid extension of smooth pavements. In fact, the cry for smooth pavements has become general in New York. Recently Mayor Strong and Gen. Collis, the Commissioner of Public Works, have received many letter from school girls, asking that asphalt pavements be put down near their school buildings to lessen the noise of travel thereabouts. Many of them complain that the noise from the cobblestone and granite block pavements is a great strain on teachers and pupils and that often it is impossible for them to hear one another during recitations. It is stated that the girls inaugurated the petition movement on their own responsibility, with the hope of securing a new pavement during vacation. Gen. Collis has written a letter to the principal of the school at Eighty-fifth-st. and Madison-ave., promising that an asphalt pavement will be laid before the opening of the fall term of school.

AMERICA'S PRODUCTION OF ASPHALTUM AND CEMENT.

We have received from Mr. David T. Day of the United States geological survey, an advance report of the mineral products for the year 1895. It shows the production of native asphaltum to have been 68,163 short tons, valued at $348,281, which was larger than in any previous year, except 1892, when it was 87,680 tons, valued at $445,375. The production of cement amounted to 8,731,401 barrels, valued at $5,482,254. In previous years it was as follows: 1890, 8,000,000 barrels, valued at $6,000,000; 1891, 8,222,792 barrels, valued at $6,680,951; 1892, 8,758,621 barrels, valued at $7,152,750; 1893, 8,002,467 barrels, valued at $6,262,841; 1894, 8,362,245 barrels, valued at $5,030,081.

THE ENGINEERING PROFESSION IN ENGLAND.

Regarding the sentiment in England on the subject of qualifications of engineers, we copy the following from the Engineering Review and Metal Worker, showing that the condition of the engineering profession in that country is similar to that described by Mr. Charles Carroll Brown in his articles in Municipal Engineering for June and July:

"One of tht greatest grievances of the engineering profession is that anyone, however inexperienced and incapable, can write after his name the letters C. E., or the symbol M. E. Similarly, any one can describe himself as a metallurgist or a mining engineer without incurring any penalty. A recent writer has pointed out the absurdity and injustice of the fact that the lawyer who gets his fees whether he wins or loses his cases, and the doctor who buries his mistakes underground, while the engineer who errs buries himself, are protected by a law which prevents unfair competition, while the engineering profession, holding, as it does, under its care millions of lives each day, is open to the irresponsible warfare of any one who may choose to hang out a sign, styling himself an engineer, whether he poisons a city with bad water or runs a sausage machine. In fact, the latter class of engineers bid fair to own the entire field, leaving the man of education and experience sunk at the bottom of an unclassifiable jumble of trades, with his birthright taken away from him, and undistinguishable from them excepting by the individual preeminence he may conquer among his clients. The name of his occupation has been rendered meaningless. The Institution of Civil Engineers in this country has tried to separate the sheep from the goats, but with very doubtful success. We will undertake to name many a M. Inst.C.E. who is not an engineer, and who has scarcely had the rudiments of engineering training. The grievance is a real one for those who have devoted much time, labor and outlay in qualifying themselves for an arduous and honorable profession."

DUTY ON REFINED ASPHALT.

The supreme court decided that the 29,400 tons of asphalt which the Standard Asphalt Company has had at the custom house in New York since May 29 is the refined material and not crude asphalt, as was claimed for it. The decision necessitated the company's paying a duty of $3,200 to release the stock.

THE NEW SLUDGE PLANT AT WORCESTER.

According to the plans for the new sludge plant, for which the city council at Worcester, Mass., has voted $100,000, there will be six machines, each nineteen feet long, four feet wide, six feet six inches high and weighing fourteen tons, which produce round cakes from twenty-eight to thirty-six inches in diameter. The full contents of a press is sixty cakes. The presses will run twenty-four hours a day and at this rate they may fall a little behind during the heaviest seasons.

The principal feature of the pressing machine is a frame supporting a row of sixty plates hung on rollers so that they may be drawn apart when the cakes are to be taken out. A covering of canvas,

like a fine quality of burlap, hangs loosely over the plates so that when they are brought together by hydraulic pressure, ready for the reception of the sludge, the canvases form a series of bags. At one end of the frame the feed pipe enters, through which the sludge is forced by the compressed air that takes it from the receiver, and the series of holes which pierce each plate at the center forms a continuation of the force-pipe. The pressure is obtained from the forcing power, for the plates are pressed as closely together as possible before the introduction of the sludge. The water from the wet sludge passes out through spiral grooves in the surfaces of the plates which terminate in drip-cocks at the lower edge of the discs. The water will then be drawn off onto a gravel filtration bed and will run off with the rest of the effluent, though it will be much purer. When the cakes are formed they will be dropped by the loosening of the plates and taken out to the dumping ground in a car that runs under the press to receive them. The machine turns 2,000 pounds of wet sludge into about 120 pounds of dry. The wet has about 97 per cent. of water and the dry about 60 per cent. The canvases used in the press are good for about 100 operations, when they have to be changed, but the stuff is not expensive.

A small experimental furnace will probably be put up within a year for the purpose of burning at least a part of the cakes.

NEED OF GOOD FOUNDATIONS.

"Slipshod methods in street paving are not confined to Milwaukee by any means," says Mayor Rauschenberger, "for there is a tendency in all American cities, especially in the West, where they have had a phenomenal growth, to lay poor foundations in the streets. They will all, in time, have to adopt the ideas of Europeans and reform these methods. It will cost more in the beginning, but in the long run the laying of a good, solid foundation will be a great saving of expense. The drawing of heavy wagons along a street is a great strain upon it, which fact can be noticed when one stops to listen to the rumbling vehicle."

FREIGHT RATES ON PAVING BRICK.

A hearing was given the petition of the brick makers of Iowa, July 15, for a reduction of 25 per cent. from the present tariffs on paving brick. The railroad representatives and several paving brick manufacturers were before the board of commissioners. The hearing developed the fact that the Des Moines, Northern and Western were favorable to the change, while other railroads feel that the Iowa rates were too low. At a meeting of the board of commissioners, July 22, it was decided to schedule paving brick at 82 per cent. of class E. This rate will, it is thought, stimulate the manufacture and use of paving brick.

Class E is used in connection with shipments of sand, rock, iron, brick, etc., Rates per mile for the class are as follows:

5 miles	$ .028
25 miles	.034
50 miles	.040
75 miles	.044
100 miles	.048
200 miles	.080
300 miles	.110
400 miles	.160
500 miles	.210

SUIT AGAINST IOWA PAVING BRICK MANUFACTURERS.

S. A. Robertson of Des Moines, Ia., has brought suit against the four paving brick companies located there, charging that they are in a trust or combine, and are transacting an illegal business. He asks for an injunction restraining them from bidding on local contracts. Robertson was formerly manager of one of the companies.

AN EXPERIMENT IN CONCRETE FOUNDATIONS.

As an experiment, the contractors at Des Moines, Ia., who are paving W. Third-st. are using broken brick instead of stone in the concrete foundation. It is cheaper and they believe it will prove to be as good as the concrete, in which broken stone is mixed. The result will be awaited with interest.

CONTEST OVER ASPHALT PAVING IN NEW HAVEN.

The board of aldermen, New Haven, Conn., has unanimously passed a resolution refusing to sanction the contract made recently with the Boston Asphalt Company, by the Board of Public Works, for paving W. Chapel, Orange and Trumbull-sts. The resolution has been tabled by the board of councilmen, but it is thought that it will be passed at a later

date. The Boston Asphalt Company alleges that it has a contract which it has prepared to carry into effect and which it proposes to enforce. A consular invoice for a cargo of rock asphalt, consigned to the Boston Asphalt Company, which will be delivered at New Haven, was recorded at the custom house, July 24.

NEW PUBLICATIONS.

Eleventh Annual Report of the Illinois Society of Engineers and Surveyors, Published by the Society. Jacob A. Harmon, Executive Secretory, Peoria, Ill. Price, 50 cents.

This pamphlet of over 200 pages contains a very full report of the last meeting of the Illinois Society of Engineers and Surveyors, embracing a number of papers of interest to engineers and contractors, some of them illustrated. Among these are: "The Disposal of Garbage," by Charles S. Hill; "The Air Lift Pump," C. C. Stowell; "Water Supply for Inland Cities," M. J. Blanding; "The Hydraulic Ram, for Use in Public Water Works Systems," Daniel W. Mead; "A Novel Test of the Overflow of An Artesian Well," W. D. Peirce; "Tests of a Vitrified Earthenware Water Conduit," D. H. Maury, jr.; "Sanitary Engineering," Jacob A. Harmon; "Sewage Irrigation for Profit," Walter C. Parmley; "A Topographical Survey of the State of Illinois," John W. Alvord; "The Contractor's Fair Profit," J. H. Burnham; "A Concrete Foot Bridge," Arthur N. Talbott. In addition, the volume contains reports from various committees on different branches of engineering work, and is desirable for the engineer's library.

The Engineering Index. Vol II, 1892-95. Edited by J. B. Johnson, Civil Engineer, Chairman Board of Managers and Manager of the Index Department of the Journal of the Association of Engineering Societies. Published by the Engineering Magazine, New York. Price, $4.

Those who know the value of the index of technical literature published in the Journal of the Association of Engineering Societies will appreciate having it in the convenient and useful shape of a substantially bound volume. Since 1884 the current engineering literature has been indexed with intelligent and painstaking care for the Journal by Mr. Johnson, assisted by Messrs. F. E. Turneaure, C. E.; C. B. Stuart, C. E., and J. L. Van Ormon, whose work has put the engineering profession easily in touch with the best availabe knowledge, and at a great saving of time and money. This volume, together with the one issued in 1892, gives a classified index to the important range of engineering literature published in the periodical press for the last eleven years, and, though not complete, it is still the best in existence. It does for technical literature what Poole's index does for popular literature, and the compilers deserve the gratitude of the profession for the service they have performed. The work will hereafter be carried on by the Engineering Magazine in its excellent department devoted to the review of the engineering press. The announcement is made that these index notes will hereafter be republishd annually in separate volumes, in continuous series with the two volumes already published.

"Dalles of the St. Criox." Compiled by George H. Hazzard of St. Paul, Minn.:

This pamphlet of one hundred pages, printed in two colors, comprises several interesting papers pertaining to the interstate park of Minnesota and Wisconsin, together with laws relating to it, and much information for the guidance of visitors. The editor, Mr. Hazzard, is one of the commissioners of the park. He was the originator of the project, and his zealous efforts, probably more than any other influence, brought about the legislation between the two states for the proper preservation of the picturesque beauty of the Dalles of the St. Croix. He is quite naturally an enthusiast on the subject, and he has much to be enthusiastic over. Among the papers is one by Mr. Frank H. Nutter, the landscape architect of Minneapolis, on "Public Parks and Reservations," in which he reviews their history and treatment, supplementing his remarks with a preliminary report on the interstate park at the Dalles of the St. Croix. Referring to the difference in taste and methods of the English and French, Mr. Nutter says that this is well illustrated in their treatment of forests. "In England they are to a great extent maintained in a natural state, so far as may be, considering the numbers who resort to them, while in France there is much more of the artificial in their treatment. The desire of our French friends to do something which may be recognized has, however, had, I think, a great and beneficial influence on much of the park work of the present day, as they have taught us that those areas near our cities which the practical mind has condemned as value-

less because their location and topography are such that they cannot be put to any ordinary use without extravagant cost, and so are dangerous to public health and morals for the reason that they will naturally become common dumping grounds or the resort of lawless squatters, are usually for those very reasons peculiarly adapted for parks, which thus afford a cheap remedy for this 'sore on the body politic.' The Parc des Buttes Chaumont, in the suburbs of Paris, in which some sixty acres of deserted quarries with their accumulation of debris have been transformed into a most beautiful and picturesque pleasure ground, has a world-wide reputation as a work of this kind."

Mr. Nutter thinks that while our own government has shown a commendable willingness to set apart under law large tracts of mountain and forest for reservation, still it has sadly neglected the proper care of these reservations, with the exception of Yellowstone park, and that they are in danger of being despoiled of that which gave them their value by the usual agencies of robbery and fire.

Speaking of the needed improvements of the Dalles of the St. Croix, as well as the proper treatment of park reservations in general, Mr. Nutter says: "In some minds at the present day there seems to be as great a disinclination to commit the designing of a reservation of this kind to a landscape architect as there used to be in the olden time among some classes to committing the care of their bodily health to a regularly educated physician or surgeon, because perforce he must be allied with satan. To be sure there are quacks and shysters in all professions and a landscape gardener whose sole idea of art is to fill a lawn with cannas and coleus or to construct a world or a horse of echeverias, might in his efforts to decorate only succeed in desecrating the landscape, still that does not prove false the assertion that the improvement of such a park should be based on a design which has been carefully studied and in which the end is clearly seen from the beginning. Anything strikingly artificial in such a place as this must have the effect of a discordant note, but in any locality where crowds do gather certain precautions for their own safety and the preservation of the natural features must be taken and it is, therefore, a choice of evils."

Prof. C. E. Edwards describes the origin, peculiar formation, natural history and attractive features of the Dalles and Warren Upham, secretary of the Minnesota Historical Society, tells something about the St. Croix river before, during and after the ice age. The pamphlet also contains a paper by Henry Leslie Osborn, Ph. D., on "The Mission of the Public Park with Reference to Our Native Animals and Plants."

Annual Report of the Board of Water Commissioners to the Common Council of the City of Saginaw. Mich., for the year ending February 29, 1896.

The report reviews the work done under the direction of the water commissioners, the most important feature of which was the reconstruction of the in-take by placing the mouth of the suction pipe at a lower depth to avoid a failure of supply on account of low water. The supply is taken directly from the river, screened through a brass wire, one-quarter-inch mesh. A settling basin was made at the in-take 22 by 75 feet in area, by sheet piling, made from white pine plank, decked over with three-inch white pine plank. The total receipts amounted to $70,115.07 and the disbursements were $55,852.54, leaving a balance of $14,252.43.

Illustrated Altoona. A pen picture of the city of Altoona, Pa.; historical, descriptive, statistical; with map, edited by Chas. B. Clark. Published by the Board of Trade.

This elaborate descriptive and illustrated exposition of Altoona, for which we are indebted to Mr. Harvey Linton, city engineer, embraces much information about the water works system, the street paving and the sewers of Altoona.

ASPHALT IN TEXAS.

To the Editor of Municipal Engineering:

Having stumbled accidentally across a couple of back numbers of your highly appreciated magazine, I was smitten at first sight.

There is within a few miles of Gainesville a vast amount of asphalt. Thousands of tons can be had from the grass roots down. It is identical with the same material found in Australia and known to the trade there as "sand asphalt." The material at hand here has been experimented upon in a small way for street paving and as such has proved highly satisfactory, comparing favorably with other asphalt used at the same places. For no other reason than lack of "push" on one hand and absence of capital on the other the vast deposit of asphalt in this neighborhood remains

undeveloped to hardly any extent whatever. Here is a chance for "ground floor men" without a doubt.

T. F. M'GRANE.

Gainesville, Tex., July 3.

PERSONAL.

Mr. Samuel Fitch, ex-mayor at Rockville, Conn., is dead.

Mr. William Haskins, city engineer at Hamilton, Ont., died July 5.

Capt. John A. Shannon has been elected city engineer at Oskaloosa, Ia.

Mr. Geo. V. Alsop has been elected city engineer at Newport News, Va.

Mr. Bascom Sykes has been elected city surveyor at Portsmouth, Va.

Mr. George E. Nugent, assistant engineer, Cincinnati, O., died July 5.

Mr. F. A. Ruhe has been re-elected water commissioner at Allentown, Pa.

Mr. S. M. Seymour, C. E., died June 21 at Danville, N. Y., aged eighty years.

Mr. David Ellinger succeeds Mr. George Osler as a sanitary officer at Harrisburg, Pa.

Mr. Frank W. Crane has been appointed borough engineer at Bloomfield, N. J.

Mr. Charles Cutter has been appointed deputy superintendent of sewers at Boston, Mass.

Mr. W. H. Colson has been appointed superintendent of sewers in district No. 1, Brooklyn, N. Y.

Mr. Adolph Pluemer has been made secretary of the board of water commissioners at Cincinnati, O.

Mr. A. Cranston Thompson has been re-elected sewerage commissioner for a three years' term at Brookton, Mass.

Mr. E. A. Rudiger, civil engineer and contractor, formerly of Nebraska City, Neb., has moved to Floral Park, N. Y.

Mr. Ernest G. Barrow, assistant city engineer at Hamilton, Ont., has been appointed city engineer to succeed Mr. William Hoskins.

Mr. E. A. Kemmler, assistant professor of civil engineering in the Ohio State University, Columbus, O., has resigned the position to accept that of engineer of sewers in Columbus. Mr. C. E. Sherman succeeds Mr. Kemmler as assistant professor of civil engineering.

Dr. Thomas C. Mendenhall has been appointed to succeed Mr. George A. Perkins as chairman of the highway commission of Massachusetts.

Mr. J. A. Gillespie of Knoxville, Tenn., and vice-president of the Alabama street paving brick company, Hartsville, Ala., committed suicide recently by cutting his throat.

Mr. Oscar Knapp has been appointed water purveyor at Brooklyn, N. Y., to succeed Mr. Peter Milne, who was recently made chief of the department of city works.

Mr. F. P. Manwell, civil engineer and surveyor, North Attleboro, Mass., has removed to Boston. His engineering business has been purchased by Mr. F. T. Westcott of Pawtucket, R. I.

Mayor Black, Chester, Pa., has appointed five park commissioners to serve as follows: John N. Wilson and Dr. J. L. Forwood to 1898, Maj. J. A. G. Campbell, F. A. Howard and William H. Sproul to 1900.

Mr. John A. Moody, assistant commissioner of public works, Chicago, Ill., has been appointed acting commissioner. Mr. William D. Kent, who resigned May 18, has continued to discharge the duties of the office until the appointment of Mr. Moody.

Mr. William H. Gallup of the Syracuse improvement company, Syracuse, N. Y., was struck by a train and instantly killed, June 29, at Jones Point, N. Y., where he had gone on business relating to a contract which he had for the removal of gravel and sand. Mr. Hendrick S. Holden has been appointed general manager of the Columbia contracting company, to succeed Mr. Gallup, who held that position also.

Mr. R. P. Rothwell, editor of the Engineering and Mining Journal, in a letter to Municipal Engineering, says that the statement in the biographical sketch of Mr. H. K. Landis in our July number that he (Landis) was editor in charge of the Mineral Industry in 1894 is erroneous. Mr. Rothwell says that Mr. Landis, while in his office, was engaged in the clerical work of collecting the statistics of mineral production, but he never did any editorial work on the Mineral Industry. Mr. Rothwell further says that the statement, also published elsewhere, that Mr. Landis was editorially associated with the Engineering and Mining Journal is erroneous.

LEGAL DECISIONS.

[Reported Specially for MUNICIPAL ENGINEERING.]

Lien for Street Work—Evidence that a husband signed a contract for street work in front of a lot, the record title to which was in the wife, and stated to the contractors that the lot was community property, will sustain a finding that he was the "reputed owner," within the laws of California, providing that any person performing work on a street in front of a lot at the request of the "reputed owner" shall have a lien on the lot for work and materials. Santa Cruz rock paving company vs. Lyons. (Supreme court California) 43 Pacific Reporter, 599.

Taxes for City Purposes—The supreme court of Iowa says that special curbing and paving assessments are not taxes "for any city purposes" within the meaning of the laws of Iowa, providing that no lands included within the extended limits of a city, not laid off into lots and which shall in good faith be used for agricultural purposes, shall be taxable for any city purposes. Farwell vs. Des Moines brick manufacturing company, 66 N. W. Reporter, 176.

Street Improvements—It is competent for a municipal authority of a city, under the powers conferred by charter, in the improvement of its streets, to provide in a single ordinance for the pavement of several streets, a single street, or a portion of a street, and to charge against the property of abutting owners two-thirds of the cost of such improvement. Mayor of Savannah vs. Weed. (Supreme court Georgia) 23 S. E. Reporter, 990.

Validity of Assessment for Street Improvements in New York—Under the laws of New York, providing that a city may order paving to be done by special assessment, upon a petition signed by the owners of a majority of the lineal feet fronting that part of the street to be paved, an assessment levied for paving ordered on a petition which, though believed to represent such owners, did not in fact do so, is void for want of jurisdiction.—Miller vs. Amsterdam (Ct. App. N. Y.) 43 N. E. Reporter, 632.

Validity of Municipal Contract—A municipality whose charter authorizes it to improve its streets by contract and requies it to take a bond from the contractor for the faithful performance of the work, may make it a requirement of the contract and a condition of the bond that the contractor shall "pay to the proper parties all amounts due for material and labor" employed in the performance of the contract.—St. Louis (use of Glencoe Lime & Cement Co.) vs. Von Phul (Supreme Ct. Mo.), 34 S. W. Reporter, 843.

Contract With City Official Void—Where it is provided by statute that no member of a city government shall be interested, directly or indirectly, in any contract entered into by such government while he is a member of same, and a member of the city council is a member of a firm having a contract with the city, no action can be maintained thereon, as it is void by the statute. All persons acting under the employment of town or city officers must take notice at their peril of the extent of the authority of such officers. Goodrich vs. Waterville (Supreme Jud. Ct. Me.), 33 Atlantic Reporter, 659.

Injunction Against Water Company—Where the water furnished by a water company, incorporated under the laws of Pennsylvania, for the use of the inhabitants of a town in that state is utterly unfit for domestic use or use by domestic animals, and is so destructive to pipes and boiler flues as to be unsafe for steam purposes it is proper to enjoin such company from collecting water rents for other purposes than for extinguishing fires and flushing sewers. Brymer vs. Butler Water Company (supreme court, Pa.) 33 Atlantic Reporter, 707.

Liability of City for Street Improvements—A municipal corporation which contracts to pay for street improvements by assessments upon abutting property is primarily liable to pay the contract price itself, if it has no power to make such assessments, or if it fails to make them, or if the assessments it attempts to make are void. The court said: When the contractor has performed his work according to his contract he has no duty remaining to discharge, and then has a right to rely upon the implied obligation of the city to use with due diligence its own agencies in procuring the means to satisfy his claims. Barber Asphalt Company vs. Denver (U. S. circuit court app.) 72 Fed. Rep., 336.

Not Liable for Debts of Sub-Contractor—One who contracted for certain street improvements with a city agreed to pay all sums due for material furnished and gave a bond to the city to that effect. The supreme court of Oregon held that as he was not liable, under either contract or bond, to creditors of a sub-contractor for materials furnished, an assignee of the contract incurred no greater liability. Browser & Thompson Lumber Company vs. Miller, 43 Pacific Reporter, 659.

MACHINERY AND TRADE.

COMBINATION OF SEWER PIPE COMPANIES DISSOLVED.

The Union Sewer Pipe Company of Akron, O., composed of a number of the leading manufacturers in Ohio, has dissolved, because, according to resolutions adopted by the stockholders, "competition among manufacturers and dealers in sewer pipe has reduced prices of pipe so low that this company in the present condition of trade cannot profitably handle and market the pipe at the prices scheduled in the several contracts with said manufacturers." These manufacturers are the Akron Sewer Pipe Company, the Buckeye Sewer Pipe Company, the Hill Sewer Pipe Company, the National Sewer Pipe Company, the Summit Sewer Pipe Company, the Robinson Bros.' Company, George R. Hill, Crown Fire Clay Company and Harry Thompson. The contracts with these manufacturers for further delivery of pipe have been cancelled. The affairs of the company will be closed by John W. Chapman.

TRADE NOTES.

Select council, Easton Pa., voted not to purchase a road roller.

A street sprinkler will be purchased by subscription at Hanover. N. H.

The paving brick works at Oskoloosa, Ia., has ceased operations for the present.

The city council, Neenah, Wis., has appropriated $225 for the purchase of a road machine.

The board of aldermen of Asheville, N. C., has decided to purchase a stone crusher. Mayor Cooke.

The city clerk at Waterloo, Ia., says the city does not contemplate the purchase of a stone crusher.

The purchase of two street sweepers has been recommended by the board of public works at Quincy, Ill.

The Iowa Brick and Pipe Works, Des Moines, Ia., have commenced operations to fill orders for paving brick.

Circulars and price lists for brick machinery are desired by G. W. Cross, 610 Thirteenth-st., Washington, D. C.

The city engineer at Winnipeg, Man., estimates that 750 barrels of cement will be needed in the improvement of the Main-st. bridge. Tenders have also been called for about $900 worth of sewer pipe.

The question of purchasing a stone crusher was again discussed at a special meeting, July 16, at Montpelier, Vt.

The plant of the Jamestown Shale Paving Brick Company, East Jamestown, N. Y., which burned, June 14, will be rebuilt.

S. C. Bradley, selectman, Fairfield, Conn., says the town has just purchased one of the latest improved road machines.

The purchase of a road roller and stone crusher is contemplated at Salem, Mass., Charles W. Davis, superintendent of streets.

The American Engineering and Inspecting Association of Albany, N. Y., has been succeeded by Stowell & Cunningham.

The Columbus Sewer Pipe Company, Columbus, O., has put in railroad side tracks on both sides of its factory, kilns and storage yards.

The Kentucky Fire Brick Company, Portsmouth, O., has received an additional order from New Orleans, La., for 1,500,000 paving brick.

The Portland Cement Company of Utah has been incorporated by E. R. Lilienthal, J. W. Lilienthal and Robert McF. Doble, at San Francisco.

The purchase of a roller is suggested by the press, at Bathgate, N. D., as a means of accomplishing needed improvements on the county roads.

Orders have been adopted at Worcester, Mass., directing the street commissioner to purchase a steam road roller at an expense not exceeding $3,000.

The Ticonderoga Stone Crusher Company has been incorporated at Ticonderoga, N. Y., by A. H. Weed, James Maloney and C. A. Stevens.

The state will purchase a roller and crusher for East Bridgewater, Mass., if the county commissioners grant the right to the town to construct a road.

The Wrought Iron Bridge Company, Canton, O., has a contract for constructing two steel buildings for the Hyde windlass company, of Bath iron works

The stone crushing plant belonging to C. W. Blakeslee & Sons, and located at Westville, Conn., was totally destroyed by fire, July 15. The company will probably rebuild.

The Interlock Brick Company has been incorporated to manufacture machinery at Philadelphia, Pa., by Philip F. Nash, George Davis and George W. Lockrey.

A committee of the council, Wansau, Wis., has recommended the purchase of a stone crusher from the F. C. Austin Manufacturing Company of Chicago and a road roller from the O. S. Kelly Company.

Mr. G. C. Stoll, secretary, advises Municipal Engineering that it has been decided to hold the next annual convention of the Illinois Clay Workers' Association at Galesburg, Ill., Tuesday and Wednesday, Jan. 19-20, 1897.

The Royal Clay Manufacturing Company, Uhrichville, O., has made an assignment to Ross J. Alexander of Bridgeport. The assignment was caused by pressing liabilities, a large stock of goods on hands, and a lack of orders.

Judge Acheson of the circuit court awarded an injunction recently on the complaint of the International Pavement Company of Hartford, Conn., Benjamin F. Richardson of Norristown, Pa., restraining him from using certain patented machines and presses in manufacturing asphalt blocks.

The Souix City Paving Brick Company, Sioux City, Ia., is in operation. The Sioux City Sewer Pipe Company has sent a number of paving brick to eastern factories to undergo thorough tests for abrasion, absorption, and tensile strength. This company has ten kilns with a capacity of burning at least 500,000 brick a month. It first gained the idea of using its kilns for burning paving brick from eastern factories who do this when they have no orders for pipe.

Bids are invited until Aug. 13 at Boston, Mass., for cement, sand and stone for battery at Long Island Head, Mass. S. M. Mansfield, United States engineer.

Brick paving contracts awarded at Cedar Rapids, Sioux City and Council Bluffs, Ia., will require 11,000,000 brick, which will be supplied by plants at Des Moines.

The purchase of a road roller is suggested at Joliet, Ill., and business men and aldermen are unanimous in the opinion that it would be economy for the city to purchase one. The highway commissioners are also advised to purchase a road roller for the county roads.

W. F. Lawton, city clerk at Petoskey, Mich., says the council has taken no action yet regarding the purchase of a road roller. Some of the members have entered into an arrangement by which they expect to get an Aultman roller on trial, and if it proves satisfactory may buy it.

Thomas Tostevin, city engineer at Council Bluffs, Ia., says that the purchase of a steam road roller, although informally discussed in the council, is not at present probable. The city has purchased a road grader of the F. C. Austin Manufacturing Company of Chicago. No other purchases are at present contemplated.

Bids were received for a road roller, July 7, at LaSalle, Ill., from the Aultman company, Canton; Harrisburg Foundry and Machine Company, Harrisburg, Pa.; Pitts Agricultural Works, Buffalo, and the O. S. Kelly Company, Springfield, O. The bids ranged from $2,690 to $3,500, each company presenting several bids, according to weight.

SELECTIONS FROM THE PRESS.

TO STRENGTHEN ASPHALT PAVING.

A novel experiment in street paving is about to be made in South Park avenue, between Sixty-third and Seventy-sixth streets.

Some time ago an inventive genius produced what is called "expanded steel." This is simply a thin sheet of metal with slits cut in it and expanded lengthwise by forcing these suits into diamond-shaped apertures. It was at first used only as a substitute for lathing in the construction of buildings, but now it is to become part of a new method of laying asphalt pavement, and will be given its first trial on South Park avenue. It is proposed to have steel sheets of one-half inch in thickness cut into large-sized strips and then expanded under powerful pressure. The sheets will be inserted flatways in the concrete base by first laying four or five inches of the stone and cement mixture and then covering the entire surface with steel, and over this steel in turn

will be put the rest of the concrete. When partly dry the base will be compressed by ten-ton rollers and the concrete mixed forced into the interstices in the steel sheets, the whole, when solidly set, forming a foundation which will not only afford a much greater weight-resisting surface than the old system of asphalt paving, but furnish as well an effectual barrier to the picks and axes of the vandals.

Damage to the top coating of an asphalt pavement causes but small expense or annoyance nowadays. Time was when repairs to the top could only be made by tearing up a good-sized section of the pavement and relaying it entirely, and even then the job was seldom satisfactorily done, as it was almost impossible to get an even surface on the patch.

Now, when the top coating needs fixing a man comes along with an ingenious gasoline contrivance, something on the principle of a plumber's blow furnace, except that it is mounted on wheels. He shoves it along over the spot to be repaired and the fierce heat, directed downward, quickly softens the asphalt so it can be readily smoothed over by the rolling machines or hand weights, and an even surface secured.

It is only when the base or foundation of the pavement is cut through or disturbed that trouble is now found in replacing an even surface, and this, it is expected, will be obviated by the use of the combined steel and concrete base. The difficulty of cutting through the mass will force the making of water, sewer and gas connections before the pavement is laid, and where htis is not done it will be cheaper and easier to tunnel under the street from the sidewalk than to tear up the pavement.—Chicago Tribune.

THE SEWAGE OF PARIS.

Very extensive sewerage works have been in progress in Paris during the past few years, and will be brought to a conclusion by the year 1899. The governing principle has been in the first place to totally prevent all untreated sewage entering the Seine, and in the second to adopt in its completest development the system of water carriage which, as originated in this country some sixty or seventy years ago, raised the ire of German chemists, who complained of the waste of manurial material. At the present moment the discharge from the Paris sewers amounts on the average to 590,000 cubic yards per day, though its value may vary 20 per cent. more or less, without taking account of exceptional storms. For purifying the sewage irrigation farms have been laid out, the first of these, that on the peninsula of Grenevilliers, dating from 1869.

Progress was then interrupted by the war, but since then the area at this spot treated has been greatly extended, and now amounts to very near y 2,000 acres. The land treated was originally an arid and sandy waste, the value of which is said to have been treated five fold by the process, being now cultivated as kitchen gardens. This land, it should be stated, does not belong to the municipality, but to private individuals, to whom the sewage is delivered on demand, the flow to the land being entirely under the control of these proprietors. All sewage not required by them flows direct to the Seine. As an average these lands at Grenevilliers take about 117,000 cubic yards per day, with a minimum of 75,000 in February and a maximum of 170,000 in June; the average corresponds to covering the soil to a depth of about 9-16 inch every day. The whole of the remaining sewage, amounting to about four-fifths of the total, has up to the present, been turned directly to the Seine. As regards frost, it is stated that even during the heavy and long cntinued frost of last year, the supply to the land in February did not fall sensibly below the average although during this period only about one-sixth of the area in question was irrigated at any particular time.

The success attained here has been so great that the Paris municipality determined to extend the system, and acquire powers for treating another 2,000 acres in the peninsula of St. Germain. This work was completed in July last year, and a quantity of sewerage amounting to 53 cubic yards per acre per day is thus disposed of, or about 106,000 cubic yards in all. An acqueduct eight and one-half miles long was constructed specially for this work, its dimensions being fixed with a view of passing in the future nearly double the present total sewage of Paris, it being intended to prolong it to other irrigation farms further on. The farm at St. Germain belongs to the city, but is occupied and worked by private parties, who are simply bound not to take less than 19,000 cubic yards per acre per annum. In this way about half the present output of the Paris sewers is satisfactorily provided for, and the remainder will be dealt with in a similar fashion. Powers have been acquired for delivering sewage to another 12,356 acres still further down the valley of the Seine.—Engineering.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Boston, Mass.—Street Commissioners Innis, Dorr and Duane made a visit to St. Louis and Kansas City, Mo., to investigate systems of laying out streets.

Newark, N. J.—Sand will be used between the brick in the construction of the paving on Astor street as an experiment, to prevent the rumbling from the pavement.

Harrisburg, Pa.—The preliminary injunction to restrain the Barber Asphalt Paving Company from proceeding with the paving of Eighth street, was dissolved by the court, July 3, and the company has resumed operations on the pavement.

Canton, O.—W. E. Young, president of the city council and members Walther and Turnbull, and L. E. Chapin, city engineer, visited Akron July 19 to inspect the wire-cut brick pavement which has been laid.

San Francisco, Cal.—The owner of the Emporium building will experiment with a pavement which is very much in use in Paris and Berlin. The foundation will be basalt rock made immovable by cement with a surface of small block of prepared wood with asphalt and sand coating.

Council Bluffs, Ia.—The members of the city council are in favor of taking up the old blocks in the center of the street and making a roadway composed of muck from Indian creek and cinders. The muck is gumbo and when wet is as sticky and adhesive as glue, and mixed with cinders would make a firm and durable roadway.

Monmouth, Ill.—Brick as a paving material for country roads is being considered by the commissioners of Warren county. The road that is being discussed is 3,000 feet in length, and as planned, it will be seven feet of single course brick with a crushed stone extension three feet wide on each side.

Newark, N. J.—Superintendent Mundy of the Board of Public Works says: "You may say what you like, but asphalt without the natural oil in it is next to worthless. The oil is the life of asphalt and experience has taught that none but the natural oil will remain in the asphalt. They compare prices Newark has been paying for asphalt paving with those obtained by other cities, but fail to take into account the fact that we have a heavier coating of asphalt than most cities and also that the Newark bids are for the whole work, whereas in many cities the bids for the asphalt coating are separate from those for the foundation. Figures, you see, may be misleading."

Hartford, Conn.—The state good road law has been taken advantage of by eighty-six of the 167 towns of the state, and in almost every case the result has been satisfactory to the town. According to press reports, however, a disposition has appeared to question the justice and desirability of the law; that while it is a good thing for the little towns, the cities and large towns derive no benefit from it; also, that the law is in danger of being repealed.

Omaha, Neb.—The suit brought by Judge Wakely to restrain the collection of the tax levied to pay for the paving of Nineteenth street, from Davenport to Cumming, with cypress blocks has been decided in favor of the city by Judge Powell. The decision sustained the position of the city that Judge Wakely held the petition of the property-owners that had given the city jurisdiction, and that the property-owners had waived all right by not protesting against the work at the time it was done.

Worcester, Mass.—The demand for new roads is far in excess of the ability of the state to supply them. Of 270 towns in the state, all but about fifty have filed petitions for a piece of state road. In the list of places which will receive attention this year are sixty-four towns. In Worcester county the appropriations for this year are: Athol, $9,700; Auburn, $4,600; Fitchburg, $4,800; Holden, $3,500; Leicester, $8,000; Paxton, $5,200; Shrewsbury, $11,200; Warren, $9,000; Westminster, $8,300; Worcester, $7,000.

The Cincinanti Post says that an agreement was reached July 10 which made Maj. Eberhardt the Cincinnati representative of the Southern Granite Company, the sole agent for the brick paving companies who furnish material in that city, up to the standard of the board of administration's specifications. The deal will, it is claimed, have the effect of shutting out competition among brick contractors as well as being the means of bringing about the exclusive use of the granite which Maj. Eberhardt represents.

Providence, R. I.—The work of the Good Roads Commission is reported as not having met with unqualified approval. Applications have been received from a score or more of towns all over the state, but the work is not pushed with enough speed to prove entirely satisfactory. Instead of having a number of contracts under way simultaneously, the same force is employed the whole year in finishing up one or two pieces of work before commencing others. As to whether or not that plan is the best, is a question among interested parties, but some of the towns are inclined to think it is not, for delay tends to cool the enthusiasm for good roads in small towns.

Kansas City, Mo.—A new paving rock has been found by J. C. Lawrence, a mineralogist, which is a bluish, flinty substance, and much harder than Wisconsin granite. It lies in large deposits, easy of access, within 400 miles of this city, and can be delivered at $1 a square yard less than Wisconsin granite. It is pronounced superior to anything yet used in this city.

Hoboken, N. J.—The certiorari proceedings to set aside contracts awarded by the counsel to contractors who proposed to use other asphalt than that required by the specifications, was decided against the counsel and not in its favor, as Municipal Engineering through error, stated in July. The Barber Asphalt Paving Company has had no litigation with the city. The certiorari proceedings were brought by others.

Pittsburg, Pa.—Suit was brought by the Municipal league, recently to restrain Director E. M. Bigelow from awarding a contract for asphalt paving to Booth & Flinn on the ground that they were not the lowest bidders, but that the Pennsylvania Asphalt Company presented the lowest bid. Director Bigelow claims that on consultation with his private counsel, he was advised that the Pennsylvania Company was not a legal bidder for the reason that it bid on Bermudez asphalt, and did not follow the specifications which discriminated in favor of Trinidad lake.

CONTEMPLATED WORK.

Cincinnati, O.—Oak street will be paved with brick.

Blairville, Pa.—Market and Walnut streets will be paved.

Atlanta, Ga.—Paving has been requested for Elizabeth street.

South Bend, Ind.—Brick paving is contemplated for three streets.

Reading, Pa.—Paving is contemplated for Penn street, from Front to Eleventh.

Lowell, Mass.—About 2,000 square yards of Moody street will be paved with brick.

Newton, Ia.—This city contemplates putting in brick street crossings.

North Tonawanda, N. Y.—Several streets will be graded and some will be paved.

Dubuque, Ia.—Brick paving is contemplated for the entire length of Iowa street.

Milwaukee, Wis.—Greenfield avenue, from First to Eleventh avenue, will be paved.

Charleston, S. C.—The improvement of the streets is contemplated. Address T. A. Hugenon.

Asheville, N. C.—The board of aldermen contemplates macadamizing sundry streets, Mayor Cocke.

Leavenworth, Kas,—An effort is being made to have Fourth street, from Shawnee to Choctaw, paved with brick.

Niagara Falls, N. Y.—Asphalt paving is contemplated for Pine street, from Third to Eighth.

Portland, Ore.—Asphalt paving is contemplated for Washington street, work on which will probably begin in September.

Ann Arbor, Mich.—Paving is being agitated for Main street, from William street to Miller avenue.

Santa Ana, Cal.—The floor of the Main street bridge across Santiago creek will be paved with asphaltum.

Plainview, Minn.—The council has been asked to macadamize Broadway, at an estimated cost of $1,500.

Pawtucket, R. I.—A petition has been filed for about 3,000 lineal feet of asphalt paving on Cottage street.

Lansingburg, N. Y.—The question of paving Seventh avenue, at a cost of about $100,000, is contemplated.

South Portland, Me.—The citizens voted July 11 to appropriate $3,000 towards paving Bridge street.

Laporte, Ind.—A concrete bicycle path between Chicago and this town, a distance of sixty miles, is contemplated.

Meriden, Conn.—The question of issuing $200,000 in bonds for paving is being considered by the council.

Lynchburg, Va.—Specifications have been prepared for macadamizing the road leading to Spring Hill cemetery.

Marquette, Mich.—Bids have been authorized for improving Bluff street, between Park and Lincoln avenues.

Waukegan, Ill.—Specifications have been ordered prepared for paving Water street, from Sheridan road to Genesee.

Brooklyn, N. Y.—Maspeth avenue, between Kingshead and Bushwick avenues, is to be repaved with asphalt.

Cincinnati, O.—Hopple alley, from Main to Sycamore, will be paved with brick, at an estimated cost of $2,293.

Bloomington, Ill.—The town council of Normal voted recently to build about four miles of brick sidewalk this summer.

Newtown, N. Y.—Asphalt paving is proposed for Broadway. A petition has been filed for extending the Grand street paving.

St. Louis, Mo.—An appropriation of $14,000 for street improvement, and $27,000 for street reconstruction, will be recommended.

Joliet, Ill.—Jefferson street, from the Chicago & Alton tracks to the river on the west side, will be paved with brick.

Far Rockaway, N. Y.—The question of bonding for $175,000 for macadamizing, sewerage and other improvements, is being favorably discussed.

Kenton, O.—Grove and Letson streets will be improved by grading, guttering and graveling. A. F. Fry, president city council.

Ypsilanti, Mich.—The committee on ordinances has been instructed to draft an ordinance relative to paving streets and sidewalks.

Wickliffe, Ky.—Plans have been prepared for paving several streets by J. B. Postlethwaite, of Paducah; W. T. White, W. O. Schelburn and I. E. Conley interested.

Rochester, N. Y.—A new ordinance has been passed for paving Allen street with Medina dressed block pavement on either side of the street outside of the rails, from State to Kent street, and with Medina stone from that point to the canal.

Evanston, Ill.—W. A. Dyche, Mayor, and Mark Wymond, Commissioner of Public Works, visited Terre Haute, Ind., July 23, to inspect brick street paving, and Indianapolis to inspect asphalt and brick paving.

Trenton, N. J.—An ordinance for paving Hamilton avenue with sheet asphaltum outside the car tracks was passed July 21. Bids were also ordered advertised for paving South Broad street, from the canal bridge to Jennie street.

Shreveport, La.—Some street paving is to be done soon. R. N. McKellar, Mayor, J. C. Winbush, City Engineer, and Councilmen D. A. Alston, A. C. Heptbur and N. B. Isnoff visited Memphis, Tenn., July 13, to inspect the street paving of that city.

North Hempstead, N. Y.—Resolutions were adopted by the Board of Town Officers, July 3, authorizing Supervisor Denton to petition the board of supervisors for permission to bond this town in the sum of $56,000 for road improvements.

Springfield, Mass.—The extension of Water street through to Fulton street under the Boston and Albany tracks is contemplated, thus giving a third district thoroughfare from the northern to the southern end of the city.

New Britain, Conn.—Estimates will be considered for paving 4,000 yards of Main and Church streets, near the park. The material has not yet been decided upon, but it is known that the majority are in favor of asphalt.

Hartford, Conn.—The Street Board adopted a resolution July 8 for paving during the season of 1897 the following streets, or parts thereof: Sheet asphaltum, Main, from Windsor northerly; Church, from Main to Trumbull; Trinity to Capitol avenue. Asphalt block, Asylum, from Main to Spruce; Ford to the bridge. Granite blocks, Asylum, from Spruce to the top of the hill.

St. Louis, Mo.—The estimated cost of reconstructing Twelfth street between Market and St. Charles with asphaltum is $4,000, exclusive of the proposed twenty-foot granitoid sidewalks.

Peoria, Ill.—The property owners on N. Jefferson street, between Cornhill and Abington, have asked that the street cars be removed and the street paved with asphalt.

Johnstown, Pa.—(Special.)—W. S. O'Brien, city clerk, says that about $20,000 worth of brick paving will be done this year. It is not probable that any road machinery will be purchased.

Rochester, N. Y.—An ordinance is being prepared for an asphalt pavement on Monroe street, from Oxford to Alexander. The old stone pavement will be used as a foundation.

Binghamton, N. Y.—The joint committee of the common council, which was appointed to investigate the most suitable pavement for Main street, will visit a number of cities on a tour of inspection.

Toledo, O.—Paving improvements were recommended July 21 for Michigan, Sixth, Ontario and Fourth streets. Petitions are being circulated for paving twenty different streets.

Oskaloosa, Ia.—New curbing is contemplated for C avenue and Third street this summer. Several thousand yards will be required.

Pittsburg, Pa.—Bids will be advertised for paving the two new boulevards as soon as the plans and specifications are ready.

Lansing, Mich.—City Engineer Davis, Alderman Carrin and ex-Alderman Bayard visited Kalamazoo July 16, to examine that city's method of laying brick paving.

Newark, N. J.—A petition has been presented to the board of public works for an asphalt or other equally noiseless pavement in the streets adjacent to the schools.

Benton Harbor, Mich.—Street Commissioner Shankland thinks Pipestone street should be paved. Also, that the council should pass an ordinance prohibiting the construction of any but stone or concrete sidewalks.

Brooklyn, N. Y.—Notice or intention has been published for repaving sixteen streets with asphalt paving, three with macadam, six with Belgian block and two with granite blocks.

Port Huron, Mich.—Plans have been prepared for 14,230 square yards of cedar block paving on pine board foundation, and 7,660 lineal feet of curbstone on Stone street. F. F. Rogers, City Engineer.

St. Paul, Minn.—Final orders have been passed for paving Minnesota and Cedar streets, from Third to Seventh, with asphalt. A preliminary order has been passed for paving Broadway, from Third to Seventh, with asphalt, brick, sandstone or granite.

CONTRACTS TO BE LET.

Arcola, Ill.—Sealed bids are asked until Aug. 14 for brick paving in Main street.

Denver, Col.—Bids will be received until Aug. 4 for constructing a road. H. A. Sumner, State Engineer.

Marinette, Wis.—Bids will be received until Aug. 3 for paving the Bridge street bridge. E. L. Shaw.

Southington, Conn.—The specifications for the new macadam road will be ready for the contractors about Aug. 15. John McKenzie, Engineer.

Crawfordsville, Ind.—Sealed proposals will be received until Aug. 3 for paving an alley with vitrified brick. J. D. Tracy, City Clerk.

La Grange, Ill.—Bids will be received until Aug. 3 for improving Bell avenue with brick paving and stone arching. A. H. Hurd, Clerk.

Long Branch, N. J.—Bids are asked until Aug. 10 for constructing a macadam road between Long Branch and Asbury Park. John Guire, Chairman Commissioners.

Crawfordsville, Ind.—Bids are invited until Aug. 3 for 2,625 square feet of brick paving and 1,600 lineal feet of cement curbing. T. Hoffman, City Engineer.

Archbold, O.—Sealed proposals will be received until Aug. 10 for the improvement of Defiance street. Thos. Leary, Village Clerk.

Delford, N. J.—Sealed proposals will be ceived until Aug. 3 for grading and macadamizing public streets. R. W. Cooper, Mayor.

Chicago, Ill.—Sealed proposals will be received until Aug. 5 for improving a number of streets and alleys. Joseph Downey, Commissioner Public Works.

Beloit, Wis.—Sealed proposals will be received until Aug. 7 for about 8,000 square yards of macadam and brick paving. Board of Public Works.

Washington, D. C.—Bids will be asked until Aug. 5 for constructing about 2,800 lineal feet of macadam road. Maj. Geo. W. Davis, President Antietam Battlefield Board.

Fort Monroe, Va.—Sealed proposals will be received until Aug. 7 for constructing concrete sea wall and vitrified brick pavement. J. W. Pullman, Acting Quartermaster.

Cincinnati, O.—Sealed proposals will be received until Aug. 11 for paving Clearwater street with brick and Tower street with bowlders. A. P. Butterfield, Clk. B. of A.

Haughville, Ind.—Sealed proposals will be received until Aug. 8 for constructing cement sidewalks in Germania avenue. Certified check, $100. J. W. Patterson, Bd. of Trustees.

Cincinnati, O.—Sealed proposals will be received until Aug. 20 for paving Roll avenue, from Dreman to Ralston avenue, with brick. A. P. Butterfield, Clk B. of A.

Dayton, O.—Sealed proposals will be received until Aug. 6 for paving Jackson and Green streets with block, asphalt block, or asphalt. Certified check, $5,000. C. A. Herbig, City Comptroller.

Greenwich, Conn.—Sealed proposals will be received until Aug. 5 for telfordizing a portion of the New York and Boston Post road. Bond, $1,000. N. A. Knapp, Selectman.

Toledo, O.—Sealed proposals will be received until Aug. 3 for paving with block or brick on sand foundation Fourth street, from Oak to Platt. Deposit, $500. Lem P. Harris, Cy. Clk.

Decorah, Ia.—Bids will be received until Sept. 5 for grading two hills and the valley between on the mail stage road, involving the removal of about 2,960 yards of dirt. Co. Audtr.

Jamaica, N. Y.—Sealed proposals will be received Aug. 6 for macadamizing Metropolitan avenue for a distance of about three miles. Deposit or certified check, $2,000. John J. McLaughlin.

Galesburg, Ill.—Sealed proposals will be received until Aug. 3 for paving with brick N. Cherry street 4,980 feet, and North street, 660 feet. Certified check, $500. A. W. Truedson, City Clerk.

Cleveland, O.—Sealed proposals will be received until Aug. 12 for grading, draining, resetting curbs and paving with asphalt Princeton street, from Euclid to Hough avenue. Certified check, $2,000. D. E. Wright, Director P. W.

Warren, O.—Sealed proposals will be received until Aug. 5 for furnishing about 4,539 square yards of vitrified paving brick. Check $500. Also for paving Monroe street, 4,539 square yards. Check $300. Albert E. Anderson, City Clerk.

Miamisburg, O.—Sealed proposals will be received until Aug. 8 for paving Main street with block or asphalt block; estimated amount 9,407 square yards outside street railway tracks and 1,113 square yards inside the tracks. Certified check $5,000. A. C. Schell, Clerk.

Evanston, O.—Sealed proposals will be received at the office of Charles A. Ewing, 36 Carlisle Building, Cincinnati, until Aug. 8 for paving Brewster and Hudson avenues with brick and for grading, curbing and guttering. Certified check $500 each. William H. Krapp, Clark.

Kansas City, Mo.—(Special.)—Sealed proposals will be received until Aug. 3 for grading Atherton road, from Lexington road to Rush Bottoms, and Barton (or Webb) road, from Lexington road to Little Blue river. F. J. O'Flaherty, County Surveyor.

Tiffin, O.—Sealed proposals will be received until Aug. 14 for the improvement of Adams, Lafayette and Walters streets. The bids may be for brick only, for all material and labor except brick, or for the whole improvement. J. B. Ehrenfried, City Clerk.

Van Wert, O.—Sealed proposals will be received until Aug. 14 for curbing Walnut street. Samples of stone for curbing should be sent to G. L. McKibben at least ten days before the time above specified. Certified check equal to 10 per cent. of amount bid. C. F. Manship, Village Clerk.

Gas City, Ind.—(Special.)—Bids will be received by the common council until Aug. 11 for the improvement of three streets, by grading, gravelling roadway, paving sidewalks with brick and plank curb. One street is 36 feet long, one is 2,512 feet long and one is 1,310 feet long. For plans and specifications address W. J. Kyle, City Clerk.

Evansville, Ind.—Sealed proposals will be received until Aug. 8 for paving with brick, grading and curbing, the following streets: Second avenue, from Bond to Pennsylvania; Illinois, from Garfield avenue to Main street; Third avenue, from Pennsylvania to First street; also for improving a number of alleys with brick. E. E. Clarke, Clerk B. P. W.

Milwaukee, Wis.—Sealed proposals will be received until Aug. 4 for paving with asphalt the roadway and gutters, and curbing the sidewalks with stone, the following streets: East Water street, from Wisconsin to Michigan; Biddle street, from East Water to Market; East Water and Market streets from Mason to Biddle; Oneida, from Market to East Water, including City Hall Square and the space between Oneida street and the south sidewalk of the new City Hall. G. H. Benzenberg, City Engineer.

Kansas City, Mo.—(Special.)—Sealed proposals will be received until Aug. 3 for paving as follows: Trinidad lake asphalt, Holmes streets, from Eighth to Twelfth; Washington street, from Tenth to Thirteenth. Granite blocks, alley between Main and Walnut streets, from Eighth to Ninth. Granitoid sidewalks on south side of Eighteenth street, from Prospect avenue to a point fifty feet west. Reconstructing natural stone curbing on both sides of Holmes street, from Eighth to

Twelfth street. Grading Astew avenue, from Independence boulevard to Independence avenue. City Engineer Wise.

CONTRACTS AWARDED.

Waterloo, Ia.—The contract for paving between the rails of the street railway was awarded to H. B. Hedge.

Covington, Ind.—Liberty and Washington streets will be improved by Thomas Slattery of Crawfordsville, Ind.

Nevada, Ia.—P. E. Shugart of this city was awarded the contract for grading a road at 5⅞ cents cut and 5⅝ cents fill.

Cincinnati, O.—The contract for paving Ridgeway alley with brick was awarded to J. M. Quill for $2,377.06.

Detroit, Mich.—The Barber Asphalt Paving Company presented the lowest bid for paving State street from Cass to Rowland.

Worthington, Ind.—Samuel Hays secured the contract for macadamizing the public square and Union and Commercial streets at $1.25 a foot.

Leavenworth, Kas.—The contract for paving Cherokee street with brick was awarded, July 20, to McGuire, Nasch & Carr, at 98 cents a square yard.

Iowa, City, Ia.—The lowest bid for paving Clinton street with brick was presented by William Horrabin, which was $1.17 a square yard.

Troy, N. Y.—The contract for paving Seventh and King streets with asphalt blocks has been awarded to Casey & Cavanaugh at $3.16 a square yard.

Terryville, Conn.—John H. Doolittle & Co. of New Haven secured the contract for 2,650 lineal feet of macadam road at 98 cents and $1.28 a lineal foot.

Norfolk, Va.—Bids were received, July 3, for furnishing 3,000 tons of granite paving blocks. The bids ranged in prices from $3.45 to $5.12 per ton.

Flushing, N. Y.—The contract for macadamizing two and one-quarter miles of Bell avenue was awarded to Ridgway & Chapman, 253 Broadway, New York, for $21,793.

Appleton, Wis.—J. H. Green &Sons secured the contract, July 22, for paving Mead, Sixth, Eighth, Lawrence and Harris streets for $6,264.

Jersey City, N. J.—The Barber Asphalt Paving Company was the lowest bidder for paving Claremont avenue, from Jackson avenue to Bergen avenue, a distance of 3,440 square yards.

Lebanon, Ind.—The contract for constructing the Cragun free gravel road in Eagle township was awarded to Shelburn & Byrkit of Zionsville, July 7, for $2,959.

Killingly, Conn.—The contract for the new roadway was awarded to Amos T. Bridge of Enfield at 89 cents a lineal foot for 16-foot roadway and $1.15 a lineal foot for 20-foot roadways.

Clearfield, Pa.—The contract for paving Second street, 1,200 feet, was awarded to W. B. Hughes. About 2,300 feet of curbing will be required. The contract price is $5,000.

Council Bluffs, Ia.—The contract for paving Pearl street and First and Willow avenues was awarded to E A. Wickham at $1.38½ per square yard. Des Moines brick will be used.

Hagerstown, Md.—The contract for paving Washington street, between the public square and Jonathan street, was awarded to the Virginia Brick Paving Company of Lynchburg, Va., at $1.76 a square yard.

Pittsburg, Pa.—Grading contracts have been awarded as follows: Butler and Pittsburg road, C. I. McDonald; two miles of road, C. B. McDonaghy of Portsmouth O.; four miles, Breen &Butler of Chicago.

Brazil, Ind.—The contract for macadamizing about thirteen and three-quarter miles of road in Brazil and Perry townships, for which bids were received July 7, was awarded to Kattmann & Murphy of this city and Paris, Ill., for $33,629.

St. Paul, Minn.—The contract for paving Robert street, from Third to Seventh, with asphalt has been awarded to Hennessey & Cox at $2.30 a square yard for the city's part and $2.35 for the street railway's part.

College Point, N. Y.—Only one bid was received for macadamizing Little Neck road, which was presented by Thomas F. Touhy & Co., of Flushing, and aggregated $5,560. For Causeway and Lawrence streets, Thomas F. Touhy, $13,269.

Wilmington, Del.—Simmons Bros. & Co. was awarded the contract for laying gutter and curb on Eighteenth street. The company's bid was as follows: Curb, cinder foundation, 85 cents a lineal foot; stone, 95 cents; combined curb and gutter, cinder foundation, $1.25; stone, $1.35.

Grand Rapids, Mich.—Paving contracts were awarded July 18 as follows: Brick, N. Division street, from Fulton to Monroe, Leonard & Schneider, $1,978; cedar blocks, S. Division street, from Hall street to railroad tracks, Richard Pickett, $13,298.

Baltimore, Md.—Contracts for paving were awarded July 16 as follows: Bayard street, Bruce alley, Marshall street, Patrick Reddington; Beason street and intersection of Canton and Luzerne streets, Charles J. Philbin; Baker, Covington and Lawrence streets, Patrick Keelty.

Scarsdale, N. Y.—The contract for macadamizing the old Mamaroneck road, 98,000 feet long, has been awarded to Murray & Mulberry for $8,371.50, and to J. H. Landers of Greensburg for macadamizing it to the Hartsdale station, a distance of 4,225 feet.

Canton, Ill.—The contracts for paving Second, First, S. First and W. Locust streets with brick were awarded July 15 to H. D. Dougherty at $1.06 a square yard. The paving of Pine street was deferred until next spring.

Dayton, O.—The Warren-Scharf Asphalt Paving Company was awarded the contract July 21 for paving the alley west of Ludlow street with asphalt, and M. G. Cain secured the contract for paving the alley north of Fifth street with Nelsonville block.

Davenport, Ia.—The paving committee of the board of public works recommended that the contract for paving LeClaire and Locust streets with brick be awarded to Flick & Johnson at $1 a square yard, and for Rock Island street, to Edwards & Walsh at $1.18 a square yard.

Albany, N. Y.—The contract for paving Yates street, from Lark to Knox, and Colonie street, from N. Pearl to Edward Broeck street, was awarded to Edward F. Dillon July 6, at his bid of $8,850.10 for Yates street and $6,111.35 for Colonie street.

Buffalo, N. Y.—The Barber Asphalt Paving Company presented the lowest bid for paving Inter Park avenue, from Humboldt Parkway to Fillmore avenue, 3,470 square yards, from Ashland avenue, from Potomac street to Front avenue, 4,294 square yards.

St. Paul, Min.—The Warren-Scharf Asphalt Paving Company secured the contract for paving Summit avenue, from Dayton avenue to Sixth street, with asphalt, at $2.43 a square yard. The contract for paving Fifth street, from Wabasha to Broadway, was awarded to Hennessey & Cox.

Buffalo, N. Y.—The Barber Asphalt Paving Company was the lowest bidder, July 8, for surfacing Swan street, at $1,143, and for paving Eagle street at $1,769. For paving Lovejoy street the bids were: Asphalt, Standard Paving Company, $2,100; brick, P. B. McNaughton, $1,743. Ivy street, brick, L. H. Gipp, $9,250; Standard Paving Company, $10,950.

Brooklyn, N. Y.—The lowest bid presented July 15 for repairing Tompkins avenue with granite blocks, was that of E. J. McKeever Bros., which aggregated $37,441.55; for Saratoga avenue, F. Hickey, but he omitted bidding for old curb, which made the bid of Morton & Gorman, $2,400.60 the lowest complete bid; for Saratoga avenue, James F. Gillen, $14,595.

Allegheny, Pa.—Contracts were awarded July 7 as follows: Resurfacing walks in the park with sheet asphalt, Wadsworth Stone and Paving Company, $1.09 a square yard; furnishing sewer pipe and cement, E. A. Knox, $1,198; Ligonier block, Booth & Flinn, $4.45 per 100; gravel and sand, Hunter Coal and Sand Company, $3.48 per 100 bushels gravel, and $4.48 per 100 bushels sand.

Dayton, O.—Paving contracts have been awarded as follows: Main street, Warren-Scharf Asphalt Paving Company, $2.45 a square yard, outside of the railway tracks, and Kinnear & Graham, East Clayton block, $1.90 a square yard, between the tracks; LaBelle street, East Clayton Block, Kinnear & Graham, $1.87 a square yard; Richard street, East Clayton block, Kinnear & Graham, $1.87 a square yard; Ludlow street, Samuel Hartley.

Fort Wayne, Ind.—Bids were received July 10 for paving West Jefferson street, from Broadway to Garden, with brick, as follows: R. L. Romy—Canton brick, $6.75; Mack brick, $6.80. C. E. Moellering & Co. —Metropolitan block, $6.03; Shale paver, $5.83. Herman W. Tapp—Metropolitan block, $6.24; Mack brick, $6.40. Julius Remus—Metropolitan block, $6.69; Mack, $6.80. Thomas P. Empie—Metropolitan block, $5.99; Mack, $6.05. For paving the alley between Berry and Wayne streets, C. E. Moellering & Co. presented the lowest bid, $2.24, for Metropolitan block.

Elmira, N. Y.—Paving contracts were awarded July 20 as follows: Main street, from the bridge to Chemung Place, Medina stone, Costello & Neagle, $2.87 a square yard; S. Main street, from Chemung Place to E. Elm, Pyrogranite brick, R. A. Beardsley, $1.74 a square yard; Sly street, U. S. Brick, Ward & Cahoon, $1.83 a square yard; State street, White Haven Granite, Costello & Neagle, $2.77¼ a square yard.

Buffalo, N. Y.—The lowest bids submitted July 21 for street paving were as follows: Preston street, asphalt, Michael Newell, $7,833.63; brick, P. McNaughton, $5,998. Winslow avenue, asphalt, Michael Newell, $2,264; brick, P. McNaughton, $1,737. Tenth street, asphalt, Barber Asphalt Paving Company, $2,205; brick, P. McNaughton, $2,379. E. Parade avenue, asphalt, Michael Newell, $1,288; brick, Standard Paving Company, $1,100.

Minneapolis, Minn.—Bids were received July 10, for asphalt, brick and granite paving as follows: Vitrified brick, Iowa Brick Company, $1.91 and $1.89 a square yard; Des Moines Brick Manufacturing Company, $1.85 for vitrified brick and $1.92 for repressed brick; Columbia Paving Company, $1.99, $1.96 and $1.82; asphalt, Warren-Scharf Asphalt Paving Company, $2.49 and $2.83; E. M. Ayers, Zanesville, O., Utah asphalt, $2.45 and $2.75; granite, Canney Bros., $2 a square yard.

Louisville, Ky.—The Breckenridge Asphalt Company presented the lowest bid, July 21, for reconstructing Sixth and Kentucky streets with asphalt, and the contracts will probably be awarded to it. For resurfacing Kentucky street the company bid $18 per square of ten feet and the Barber Asphalt Paving Company bid $23.05. For entirely new asphalt in Sixth street the Breckenridge company bid $21.95 and the Barber Asphalt Paving Company $25.75.

Denver Col.—The board of public works recived bids, July 6, for paving lower Fifteenth and Broadway streets as follows: Broadway, F. O. Blake Paving Company, $2.59 a square yard; Colorado Paving Company, $2.57 Hugh Murphy, $2.10; Western Bermudez Company, $2.57; W. S. Hipt, $2.03. For lower Fifteenth street: F. O. Blake & Co., $2.59½; Hugh Murphy, $2.34½; Western Bermudez Company, $2.61; Colorado Paving Company, $2.89; E. S. Hipt, $2.03. The awarding of the contract was deferred for a time.

Utica, N. Y.—Bids were opened July 17 for paving Genesee, South and Whitesboro streets and Madison lane. The Warren-Scharf Asphalt Paving Company bid $2.50 a square yard for asphalt paving on Whitesboro street and Madison lane, $2.36 for South street, from Genesee to Park avenue, and $2.56 for South street, from Park avenue to Third street, and $2.68 a square yard for sandstone on concrete on Genesee street. The Utica Paving Company bid $2.50 for all asphalt paving and $3.10 for sandstone paving on Genesee street. J. W. Johnston and J. T. Dwyer bid $2.83 for sandstone paving on Genesee street, and John R. Baxter bid $2.78 on Genesee street for paving. The Utica Paving Company's bids were the

lowest, on South street and Madison lane, and the Warren-Scharf Company on Genesee and Whitesboro streets. The awardng of the contracts was postponed.

Wellston, O.—The contract for 9,100 square yards of brick paving was awarded, June 25, to Daniel E. Sullivan of Columbus, O., whose bid was as follows: Union Paver, 94 cents a square yard; Nelsonville, 94 cents; Athens, 89 cents; East Clayton, 96 cents; Wassail, 99 cents; Bolen, $1; Hocking, $1.20; Star edging, 17 cents a lineal foot; Berea curb, 39 cents; Berea circle, 57 cents; Portsmouth brownstone, 40 cents; Portsmouth brown circle, 60 cents; Fulton curb, 37 cents; Fulton circle, 60 cents; limestone curb, 57 cents; limestone circle, 76 cents; sewer inlet, $7.75.

St. Louis, Mo.—Contracts for paving and improving streets, boulevards and alleys were awarded, July 7, to the following contractors: Brick, Finney avenue, Delmar boulevard and Sarah street, Stifel & Ruckert; Page boulevard and Euclid avenue, St. Alphonsus street and Washington boulevard, Skrainka Construction company. Paving alley, brick, J. E. Perkinson and Allen & Vieths; limestone blocks, G. Eyerman, jr., H. Pecking & Co. and St. Louis Stone Masons Quarry and Building Association.

New Haven, Conn.—Bids were opened, July 15, for paving Wooster street, from Union to East, 10,800 square yards, and Ashmun street, from Grove to Gregory, 7,880 square yards, with vitrified brick. J. E. Miles & Company of Easton, Pa., presented the lowest bid at $1.99 a square yard without a guaranty and $2.01 with a five years' guaranty and 85 cents a square yard if the city furnished the brick. A resolution awarding the contract to J. E. Miles & Company has been referred to the committee on streets in concurrence. It is believed that the contract will be awarded on Mack brick.

Sioux City, Ia.—Bids were received, July 21, for paving Fourth, Pearl and N. Seventh streets. The Warren-Scharf Asphalt Paving Company of New York was the lowest bidder at $2.39 a square yard for the asphalt paving in Fourth street. The Barber Asphalt Paving Company bid $2.50 a square yard and the Metropolitan Asphalt Company $2.73 a square yard. For brick paving on Pearl street, M. L. Flinn presented the lowest bid, $1.54 a square yard and on W. Seventh street Hanlon & Knepper made the lowest bid, $1.69½ a square yard. J. B. Smith & Co., Chicago, bid $1.89 on Pearl and Seventh streets.

Fort Dodge, Ia.—The lowest bids received July 20 for paving Central avenue with brick, were those of J. W. Campbell of Des Moines, as follows: Lehigh brick, $1.30 a square yard; Des Moines brick, $1.37 a square yard; Des Moines brick with undercourse of Ft. Dodge brick, $1.33 a square yard; Fort Dodge brick, $1.22 a square yard. Bids were presented by three other contractors, Kennetv & McCann of Dubuque, J. W. Smith of Sioux City and J. L. Black & Co. of Des Moines. The contract was awarded to J. W. Campbell. The work aggregated 20.000 square yards of brick paving.

Warren, O.—Bids were received July 14 for furnishing 12,070 square yards of paving brick for paving Washington avenue and Monroe street, as follows: Wooster Shale Brick Co., Wooster. O., 54 cents a square yard; J. C. Devine, Alliance, O., 54 cents; Advance Fire Clay Co., Uhrichsville, O., 55 cents; Chas. J. Deckman, Malvern, O., 56, 62 and 75 cents; Brady's Run Fire Clay Co., West Bridgewater, Pa., 62 cents; Mack Manufacturing Co., Pittsburg, Pa., 62, 69 and 73 cents; Minerva Paving Brick Co., Minerva, O., 65 cents. C. R. and S. H. DeGroodt, Youngstown, O., were the lowest bidders for paving the streets.

Sandusky, O.—Bids were received July 16 for paving Osborne street, as follows: Bolen granite block, Michael McKean, Murphy's grout, $4,079.44; C. F. Hartman, Murphy's grout, $3,854.40; Saylor's cement, $3,773.40; Portland cement, $3,692.40; Michael Callan, Murphy's grout, $4,022.16; Saylor's cement, $3,927.66; Portland cement, $3,873.66; Buckeye block, Michael McKean, Murphy's grout, $4,028.44; C. F. Hartman, Murphy's grout, $3,854.40 for Saylor's cement, $3,798.40; for Portland cement, $3,692.40; Michael Callan, Murphy's grout, $4,076.66; Saylor's cement, $3,982.66; Portland cement, $3,928.66. Bemudez asphalt; Ohio Bermudez Asphalt Company, Saylor's cement, $7,045.16.

Brooklyn, N. Y.—Bids were received July 1 for paving a portion of Bushwick avenue with brick as follows: Thomas McCann, Catskill Shale brick, $1.65 a square yard; curbing, $1 per lineal foot; concrete foundation, $4 a cubic yard; grading, $1,500. M. J. Dady, Catskill brick, $1.80 a square yard; Mack, $2.15; Imperial, $2; Syracuse, $2; curbing 75 cents a lineal foot; concrete foundation, $5; grading, $849. Harris & Maguire, Catskill brick, $1.55 a square yard; curbing, 67 cents a lineal foot; concrete foundation, $3.80 a cubic yard; grading, $850. Wilson & Baillie, Mack brick, $1.72 a square yard; curbing, 95 cents a lineal foot; concrete foundation, $4.95 a cubic yard; grading, $972. J. H. Cutley, Jersey City, N. J., Mack brick, $1.98 a square yard; Syracuse, $1.40; Penn, $1.38; curbing, 75 cents a lineal foot; concrete foundation, $4 a cubic yard; grading, $849.

Kansas City, Mo.—(Special.)—Contracts were awarded during July by City Engineer Wise as follows: Curbing Fifth street, from Lydia to Laurel avenue, C. M. Cravens, 42 cents a lineal foot; grading alley between Charlotte and Campbell streets, James Fortin, at 23 9-10 cents a cubic yard; grading Mercier street, from Merrill Place to Twenty-ninth street, Patrick Keating, as follows: Dirt 14 cents, 24-inch pipe $1, rip-rap $1.25, 12-inch pipe 80 cents; grading Indiana avenue, from Independence avenue to Ninth street, Martin Murphy, dirt 8¾ cents, lumber $20 per B. M., rip-rap, $1.50, 24-inch pipe 90 cents, 12-inch pipe 20 cents. Bids were opened July 22 for macadamizing Independence Boulevard, from Walrond avenue to the eastern city limits, and from Independence avenue to a point south of Smart avenue, but were laid over until July 29. Contracts were awarded July 20 by the county court as follows: Macadamizing the Buckner road, to W. E. Rice at 91 cents a cubic yard; Troost ave-

nue, M. M. Holmes at 96 cents a cubic yard, grading Twenty-seventh street, P. C. Fielding at 11¾ cents a cubic yard; Prospect avenue, Colyer Bros. at 14½ cents.

Brooklyn, N. Y.—The proposals received July 1 for asphalt paving were considered as low as any that had ever been received by the department of city works. The most important work for which bids were received on this date was for paving Sixth avenue, from Fourth to Fourteenth street, and the contract was awarded to the Brooklyn Alcatraz Company at $1 a square yard. Cranford & Company was awarded the contract for repaving Jefferson avenue and Madison street at $1.20 a square yard. Gates avenue was awarded to the Bermudez Asphalt Company at $1.52 a square yard; the reason of this higher price is due to the fact that there is a railroad in Gates avenue, which will make it difficult to keep the pavement in good repair along the tracks during the period of five years for which the company gives a guarantee.

New York, N. Y.—Bids were opened July 22 by Commissioner Collis for paving nineteen blocks on First avenue with granite block and asphalt. The grade on all of these blocks is such that they cannot be paved wholly with asphalt, so fifteen feet of asphalt will be laid on either side of the street and the remainder will be paved with granite. A noticeable feature in the bids was that asphalt paving can be laid with a long guarantee for less than granite. The bids were: Barber Asphalt Paving Company, asphalt, $2.91 a square yard and granite, $3.50; California Asphalt Company, asphalt, $2.38, and granite, $3.60; Fruin-Bambrick Construction Company, asphalt, $3.45 a square yard, and granite $3.50; Sicilian Asphalt Company, asphalt $3.65 a square yard and granite $3.60; Warren-Scharf Asphalt Paving Company, asphalt $2.88 a square yard and granite $3.30. The contracts have not yet been awarded. The work involves the laying of 12,395 square yards of asphalt and 6,675 square yards of granite.

Indianapolis, Ind.—Contracts have been awarded during July as follows: Graveling first alley east of Dorman street, H. H. Pauley, 36 cents; first alley east of Capitol avenue, J. Harry Roberts, 32 cents; paving with cement sidewalks on Meridian street, from Union station to Raymond street, C. H. Carter, 76 cents; Graveling roadway and paving with cement and curbing with stone the sidewalks of New York street, from Miley avenue to Lafayette avenue, J. Harry Roberts, $1.87, with the stipulation that Parkhurst curb be used; New York street, from Belmont avenue to Lynn street, A. A. McCray, $1.73; New York street, from Lynn street to Miley avenue, A. A. McCray, $1.89; cement sidewalks and stone curb, Fourteenth street, from Capitol avenue to Central avenue, F. M. Snyder & Co., $1.53 a lineal foot; graveling roadway and cement sidewalks on Windsor street, from Stoughton to Orange avenue, Henry T. Nolting, $2.19 a lineal foot; graveling Twenty-sixth street, Daniel Foley, 90 cents a lineal foot each side; graveling roadway and brick sidewalks on Vermont street, P. E. Phillips, 94 cents a lineal foot; Broadway, from Twenty-third to Twenty-fifth, Gansberg & Roney, 33 cents a lineal foot; cement sidewalks on Grace street, C. H. Carter, 70 cents a lineal foot; gravel first alley east of Highland avenue, H. H. Pauley, 38 cents; north of New York street, H. H. Pauley, 37 cents; cement sidewalks on west side of Jackson avenue, Julius Keller, 83 cents; in Twenty-second street, from College avenue to Bellefontaine, Henry T. Nolting, 84 cents; Palmer street, from Meridian to Madison avenue, Davidson & Lingenfelter, 65 cents; rolled gravel and cement sidewalks in Prairie street, J. Harry Roberts, 61 cents.

SEWERS.

New Orleans, La.—Proceedings against the New Orleans Sewerage Company for annulment of contract and recovery of damages to streets in this city were filed in the civil district July 16.

Worcester, Mass.—Frederick A. McClure, city engineer, and Harrison P. Eddy, superintendent of sewers, visited Thompsonville, Conn., July 17 to look at the sludge press works of the G. H. Bushnell Company.

Brooklyn, N. Y.—This city has beeen divided into two sewer districts. One comprises the section north of Flushing avenue and east of Fulton street, and the other embraces the rest of the city. William H. Colson has been appointed superintendent of the first district and William H. Goff superintendent of the second district.

Newark, N. J.—The Passaic Valley Sewer Commission contemplates making an inspection of the whole Newark Bay, more especially in the vicinity of the present sewer outlet, and to observe the currents and effect of tides in the distribution of sewage dumped into the bay. At present the outlet of the sewer, which is operated by the pumping station, is only about 2,000 feet beyond the shore line, and at a point in very shallow water.

San Francisco, Cal.—The discovery of a sewer built at the top of a hill, without an outlet, and of no use to anyone, has been discovered by George W. Elder of the street committee of the board of supervisors. Mr. Elder considers this the most criminal instance of the waste of tax-payers' money that has yet been found in this city, not excepting his former discoveries of "cesspools in the wilderness and bituminized pavements beneath sand dunes."

Sherman, Tex.—The court of appeals, at Dallas, has reversed the case of George Lindsay against the city of Sherman, in the case of a sewer constructed in front of Lindsay's property. The lower court charged that if the city constructed the sewer in a careful manner, they should find for the defendant, even though after its construction it became a nuisance. The court of appeals holds that it is the duty of the city to keep its sewers in good condition after construction.

Peoria, Ill.—The West Bluff sewer system is about completed. Its cost has been about $200,000, but its estimated benefit to the city will amount to infinitely more.

Norristown, Pa.—A communication was recenty sent to the officias of the Norristown Hospital for the Insane by Dr. Benjamin Lee, secretary of the state board of health, complaining of the pollution of the Schuylkill by the sewage from that institution, and calling attention to the imperfect plant by which the sewage is disposed of. F. W. Farquhar, C. E., Newport, R. I., inspected the entire system July 16 and reported to the hospital officials that the system is practically perfect.

Salt Lake City, Utah.—A tour of inspection of the sewer farm was made July 20 by Mayor Glendenning and other city officials to investigate the method of the system and to obtain some idea of the amount of money that will be necessary to complete the work. About $1,000 will be required to complete the construction of the ditch which will carry the surplus water into the Jordan river. With the completion of this ditch the system will be practically perfect, on a small scale, and the matter of enlarging the farm can be done gradually.

CONTEMPLATED WORK.

Manor, Pa.—The construction of sewers is contemplated.

Louisville, Ky.—The construction of sewers is contemplated.

Irwin, Pa.—The question of public improvements is being considered.

Beverly, Mass.—A brick sewer will probably be built in Lathrop avenue.

Taylorville, Ill.—An 8-inch lateral sewer, 500 feet long, is proposed for this season.

Cleveland, O.—Bids will be invited for the proposed new sewer system in a short time .

Medford, Mass.—An appropriation of $61,000 for sewerage improvements has been made.

Middletown, O.—Preliminary steps only have been taken towards a sewerage system.

Jamestown, N. Y.—The construction of sewage filtration beds has been recommended.

Madison, Wis.—Engineers Dodge and Nader will report on the proposed sewerage system Aug. 14.—

Far Rockaway, N. Y.—The question of sewerage is being considered by the town trustees.

Freedom, Pa.—Plans have been accepted for a sewerage system, according to press reports

Memphis, Tenn.—A main sewer for the north and south ends of this city is contemplated.

Canton Ill.—Sewers will be built on South First and Locust streets. Eugene Whiting, City Clerk.

Monmouth, Ill.—The estimated cost of the proposed sewer on South Second street is $1,372.

Toronto, Ont.—A trunk sewer costing $1,000,000 is contemplated. Plans have been prepared by E. H. Keating, city engineer.

Janesville, Wis.—Plans for a sewerage system are being prepared by Perry Brown and Charles Kurtz.

Rochester, Pa.—Bids will soon be invited for constructing sewers in New York, Pennsylvania and Jefferson streets.

Conemaugh, Pa.—Plans are being prepared for a sewerage system for East Conemaugh by John H. Dye of Johnstown, Pa.

St. Louis, Mo.—A serious lack of proper sewerage system in the Kingsbury storm sewer district is reported.

Brockton, Mass.—Requests are being made of the sewerage commissioners for the extension of the system.

Quincy, Mass.—An order has been passed adopting a system of sewerage according to the plans of 1895.

Reading, Pa.—Specifications have been ordered prepared for extending the storm sewer in Penn avenue.

Montclair, N. J.—About 10,000 feet of sewer extensions in Park and Chestnut streets are contemplated.

Newark, N. J.—An ordinance has been passed providing for the construction of the East Branch intercepting sewer.

Westfield, Mass.—Plans will be prepared for a complete system of drainage to cost about $75,000 by State Engineer McClintock.

Syracuse, N. Y.—Property-owners on the Colvin tract are urging the construction of the proposed system of sewers in that locality.

Mankato, Minn.—A profile has been prepared for a sewer from the Tourtelette hospital to the Minnesota river, about 1,320 feet in length.

Wausau, Wis.—The city engineer has been instructed to prepare plans and details for the proposed sewer work, after which bids will be solicited.

Little Falls, N. Y.—The common council will probably declare intention soon to build the proposed sewerage system. The estimated cost is $7,061.66.

Moline, Ill.—Sewers will be constructed in portions of Sixth, Seventh and Thirteenth avenues and Twelfth, Fourteenth, Sixteenth and Twenty-third streets.

Mason City, Ia.—Plans and specifications for the proposed new sewerage system were considered at a meeting of the city council July 10. Bids will soon be advertised.

Niagara Falls, N. Y.—The city engineer has been authorized to advertise for bids for constructing a sewer in Eleventh street, from Buffalo avenue to the Central tracks.

Depew, N. Y.—The plans for the sewerage system have been approved by the state board of health, and the sewer commission will now arrange for a vote to be taken on the matter soon.

Clinton, N. J.—A general township sewer is contemplated as soon as the joint committee of the village trustees and the Clinton township committee can agree upon a plan for the system.

San Francisco, Cal.—The city engineer has been directed to prepare plans for a system of sewers asked for by the Potrero Land Improvement Company. J. A. Russell, clerk board of supervisors.

Quincy, Ill.—The plans and specifications for the proposed sewer construction are about completed and bids will be asked soon.

Topeka, Kas.—Plans for a drainage system for the district east of the Santa Fe shops have been completed by City Engineer Barnes.

Sandy Hill, N. Y.—Plans for a sewerage system have been prepared by John W. Burke of New York City, estimated cost $100,000. Orville Griffin.

Sharpsburg, Pa.—A new sewerage system is contemplated, and the borough solicitor has been instructed to prepare an ordinance for the increase of the borough debt to the amount of $62,000.

East Rutherford, N. Y.—The council has called a meeting of all voters for Aug. 5 to consider the petition for issuing bonds to the amount of $40,000 for the construction of a sewerage system and macadamizing the highways.

Baltimore, Md.—An ordinance has been passed by the First branch of councils appropriating $15,000 for the completion of the intercepting sewer designed to drain the district that is now partially drained by the Druid Hill avenue sewer.

Cumberland, Md.—The question of a sewerage system was discussed at a meeting of the council, July 6. A petition was filed from the property-owners along Washington and Allegheny streets, asking for a sewer on Allegheny street connecting with the public sewer on Green street.

Sacramento, Cal.—A special election will be held Aug. 11 to vote on the question of expending $65,000 for the construction of a large brick sewer on S street, from Seventeenth street to the river front, and for establishing in connection therewith, a pumping plant at Sixth street.

Worcester, Mass.—An apropriation of $100,000 has been made for a sludge disposal plant. Press reports are to the effect that F. A. McClure, City Engineer, has been authorized to engage an engineer and a chemist for consultation regarding the plans for the proposed sewage separation system.

New York, N. Y.—The bids received July 14 for thirty blocks of sewer mains in Fifth avenue were rejected by Commissioner Collis, who was not satisfied that the lowest bidder would do satisfactory work. New bids will be advertised. The bids received were: Herbert Steward, $87,860.30; P. J. Travis, $85,267.50; Bart Dunn, $75,772.90; Barber Asphalt Paving Company, $74,696; Cunningham & Kearns, $72,235.

CONTRACTS TO BE LET.

Youngstown, N. Y.—Bids are asked until Aug. 5 for a system of surface drainage at Fort Niagara, N. Y. Lieut. P. C. Harris.

Saratoga Springs, N. Y.—Sealed proposals will be received, until Aug. 4, for an 8-inch terra cotta pipe sewer in Middle avenue. Jas. D. McNulty, clerk.

Mt. Vernon, N. Y.—Bids will be received, until Aug. 4, for constructing a lateral sewer in Rich avenue, between Prospect and Sidney avenues.

Monticello, Ill.—Sealed proposals will be received until Aug. 4 for constructing 3,666 lineal feet of 6-8-inch pipe sewer. D. E. Widdersheim, city clerk.

Champaign, Ill.—Sealed bids will be received until Aug. 4 for constructing a system of sanitary sewers. Cash or certified check, $1,000. C. J. Strahle, city clerk.

Cincinnati, O.—Sealed proposals will be received until Aug. 11 for constructing sewers and drains in a number of streets and alleys. A. P. Butterfield, clerk B. of A.

Woonsocket, R. I.—Sealed proposals will received until Aug. 17 for constructing sections Nos. 1, 2 and 3 of the sewerage system. Certified check, $500. Board Sewer Commissioners.

Fargo, N D.—Bids will be received until Aug. 3 for constructing a 12-inch pipe sewer in Fourth avenue S from Eighth to Tenth street. Check, $500. A. O. Rupert, city auditor.

Brooklyn, N. Y.—Sealed proposals will be received until Aug. 4 for constructing sewers in Eighteenth street, Old Wood Point road, and Bushwick avenue. Theo. B. Willis, commissioner public works.

Frankfort, Ind.—Bids are asked until Aug. 11 for the construction of about 966 feet of 10-inch pipe sewer, with 6-inch house connections, two manholes and one flush tank. Jas. A. Price, city clerk.

Cleveland, O.—Sealed proposals will be received until Aug. 5 for constructing sewers in Columbus and Young streets. Certified check, $500 and $300, respectively. D. E. Wright, director public works.

Providence, R. I.—Sealed proposals will be received until Aug. 3 for constructing sewers in Pleasant Valley Division, Section 19. Certified check, $1,000. Robert E. Smith, Commissioner of Public Works.

Kansas City, Mo.—(Special.)—Bids will be received Aug. 3 by City Engineer Wise for constructing sewers, as follows: Public intercepting sewer from Fourteenth and Cleveland avenue to Ninth and Fairview avenue; estimated cost, $6,000. District sewers in districts Nos. 157, 158, 160, 161, 162 and 163; estimated cost, $13,000.

Altoona, Pa.—(Special.)—Sealed proposals will be received until Aug. 7 for the construction of a sewage disposal plant, including 7,669 feet of pipe sewers, and sewage carriers, 37 gates and syphon chambers, one screen tank, 200 feet of 16-inch iron syphon and 120 feet of 10-inch iron syphon. Plans and specifications and blanks for bids can be obtained of Harvey Linton, City Engineer; John Currie, Chairman Committee on Sewage Disposal, 1202 Twelfth street.

CONTRACTS AWARDED.

Rock Island, Ill.—The contract for constructing the Twenty-fourth street storm drain was awarded to John Mulhern.

Devil's Lake, N. D.—J. M. Carroll of Grand Forks was awarded the contract for sewer construction for $3,750.

Ann Arbor, Mich.—The contract for constructing pipe sewers was awarded July 2 to Sharp & Schultz of Port Huron for $9,454. There were ten bidders on this work, and the prices ranged from $9,454 to $14,943.

Hamilton, Ont.—The contract for furnishing sewer pipe was awarded to W. F. Grant & Company of Toronto, Ont.

Jersey City, N. J.—A sewer will be constructed in Irving street by Edward O'Neill and one in Central avenue by P. T. Plunkett.

Breckenridge, Minn.—The contract for constructing sewers has been awarded to James McCrosson of Fergus Falls for $1,785.91.

Berkeley, Cal.—The new Adeline sanitary district has been awarded to John P. Beckett and H. H. White for $6,341.50.

Rochester, N. Y.—The contract for the Park avenue sewer was awarded to Whitmore, Rauber & Vicinus for $5,740.24.

Fulton, N. Y.—Barlow & Company of Seneca Falls was awarded the contract, July 17, for constructing the sewerage system for $41,355.

Brooklyn, N. Y.—The lowest bid received for constructing a sewer in the Twenty-ninth ward was presented by Nolan & Keevings, $7,241.80.

Oneida, N. Y.—The contract for building a system of trunk sewers was awarded, June 29, to John Marsden & Company of Utica for $15,931.65.

Allegheny, Pa.—The contract for a lateral sewer on Ellsworth street was awarded July 7 to William J. Dunn, and on Avery street to Henry Kress.

Syracuse N. Y.—Contracts have been made with Richard Barrington Martin Lavelle and P. H. Lyons for contributory sewers at a total cost of about $16,000.

Elmira, N. Y.—Contracts for sewers awarded July 20 to the following contractors. G. H. Gridley & Co., three streets; Henry Coop, three streets; James Costello, six streets.

Rutland, Vt.—Bids were received June 16 for furnishing vitrified, salt glazed sewer pipe, bends, branches, etc., and the contract was awarded July 10 to the H. Wales Lines Company.

Racine, Wis.—The contract for constructing the Blue river sewer was awarded July 17 to Hanson & Co. of this city for $5,873, and for the Duck creek sewer to Rasmussen, Anderson & Co. for $8,169.50.

Trenton, N. J.—Bids were received July 6 for constructing six new sewers. William F. McGovern was the lowest bidder on four and William Morgan on two of the sewers.

New York, N. Y.—Bids were received July 18 for constructing a sewer in Cromwell avenue, from Jerome to Inwood avenue, from J. C. Rogers & Son, $94,579; Michael Dunn, $95,181; M. J. Leahy, $92,096; Bart Dunn, $120,330.

Boston, Mass.—Haskins & Murphy, 362 Main street, Charleston, received the contract for sections 23 and 24, and E. W. Everson, Providence, R. I., for section 25 of the Metropolitan sewer, within the limits of Dedham Center and East Dedham.

Syracuse, N. Y.—Contracts were awarded July 20 for furnishing material and constructing sewers as follows: East Genesee street, C. T. Hookaway, $1,562.40; Chester street, John W. Bustin, $729.05; West Willow street, Richard Barrington, $582.20.

Natick, Mass.—Salamon & Russo of Boston secured the contract for sewer work in Pitts street and vicinity for $10,129.40.

Ft. Dodge, Ia.—J. W. Smith of Sioux City presented the lowest bids, July 20, for constructing the stone sewer on Seventh street, from Fourteenth avenue south to the Illinois Central road. The bids were: 12-inch pipe, 75 cents; 24-inch pipe, $1.25; catch-basins, $30.

Westboro, Mass.—Contracts for constructing the sewerage system for the Westboro Insane Hospital have been awarded as follows: Reservoir and sewers, Salamon & Russo of Boston; filtration area, Lewis Mitchell. The estimated cost of the work is $12,500.

Portland, Me.—The commissioner of public works received eight bids for constructing a section of 2,600 feet of the north side intercepting sewer, July 15. The contract was awarded to R. D. Shannahan of this city for $10,528. The other bids ranged from $10,798 to $16,090.

Mt. Clemens, Mich.—Sewer contracts were awarded July 20 as follows: Front street, 12-inch crock sewer, to H. VanHollenbeck. Main sewer, 28 cents a lineal foot; laterals, 17 cents; catch-basin, $5.50; Washington avenue, 12-inch crock, Van Acker & Merdue—Main sewer, 34 cents; laterals, 18 cents; catch-basins, $5; Clemens street, 14-inch crock, Van Acker & Merdue, main sewer, $1.35; laterals, 18 cents; catch basins, $5.50.

Reading, Pa.—Wilson, Strack & Company of Chicago presented the lowest bid recently for the construction of the storm water sewer in the northeastern section of this city, their bid being $40,000 less than their nearest competitor. It is reported that differences of opinion between the board of public works and the city councils has prevented the final awarding of the contract as yet.

Milwaukee, Wis.—The bids for sewer work were readvertised and bids received again July 21 with the result of a saving to the city of $2,701.76. The contracts were awarded as follows: Pipe sewers, Herman Hohensee, four streets, at $1.42, four streets at $1.27 a lineal foot and two streets at $1.32 a lineal foot. George E. Zimmerman, brick, one street at $5 and three streets at $2.89; pipe, on E street at $1.32 and one at $1.27 a lineal foot. John S. O'Neill, pipe, East and West alley, $1.69 a lineal foot.

Erie, P.—The contract for a 15-inch tile sewer in Ninth street, from Cascade to Raspberry, was let, July 9, to David Jones, at $1.70 a lineal foot, and for a 12-inch sewer in Raspberry street, from Ninth to Tenth, to E. Driscoll, at $1.25. Contracts were let, July 16, as follows: 15-inch tile sewer in Twenty-sixth street, O'Brien & Brennan, straight and curved pipe, $1.48; branch pipe, $1.60; 9-inch pipe, 30 cents; manholes, $35; catch basins, $30; 18-inch tile in Twenty-sixth street, D. McCormick & Son, straight pipe, $2.20; curved and branch pipe, $2.30; 9-inch pipe, 40 cents; 6-inch, 25 cents; manholes and catch basins, $35; David Jones, 15-inch tile in Twenty-sixth street, straight and curved pipe, $1.65; branch pipe, $1.90; 9-inch pipe,

50 cents; 6-inch pipe, 40 cents; manholes, $50; catch basins, $40.

Baltimore, Md.—(Special.)—James A. Paige, chief clerk, says proposals were received for furnishing and delivering 72 lineal of 16-inch and 336 feet of 30-inch cast iron sewer pipe for Alluvion street sewer inlets, as follows: R. D. Wood & Company, Philadelphia, $0.0095 per lb.; McNeal Pipe & Foundry Company, Burlington, N. J., $0.0121 per lb.; Campbell & Zell Company, Baltimore, Md., $0.01005 per lb.; Howard-Harrison Iron Company, Bessemer, Ala., $0.00935 per lb.. The contract was awarded to the Howard-Harrison Iron Company.

Medford, Mass.—Bids were received July 20 for constructing three and one-half miles of the city sewerage system known as section 14, as follows: John Booth, Worcester, $11,620; J. P. O'Connell, Dorchester, $13,487.50; J. L. Bryne, West Medford, $13,577.50; F. L. Allen, Worcester, $13,680; W. T. Ross, Hampton, N. H., $13,778.50; D. A. Dorey, West Medford, $13,965; Joseph Bruno, East Boston, $15,055; John Marsden, Utica, N. Y., $15,765; H. A. Hanscom & Co., West Medford, $15,766; Craib & Trumbull, Winthrop, $16,930.

WATER-WORKS.

Rochester, Minn.—The Farmer's Loan and Trust Company of New York has applied for the appointment of a receiver for the Rochester Water Works Company.

Westerly, R. I.—A temporary injunction has been granted the Westerly Water Works Company which prohibits this town from proceeding with the proposed water supply system. The case will come up again in the fall.

Omaha, Neb.—The Omaha Water Works Company, successor to the American Water Works Company, was organized in New York City July 20, in pursuance of a plan announced shortly after the property was sold in this city. Thomas C. Woodberry of Portland, Me., is president of the new company.

Des Moines, Ia.—A report on the cost of reproducing the present water plant has been given out by Engineer Crellin. He placed the cost of reproducing the plant at $557,177.16, which is somewhat lower than that of City Engineer Higgins, who valued the new plant at more than $625,000.

Norwood, Pa.—A perpetual injunction has been granted against the officials of this borough including the town council and burgess, restraining them from spending or borrowing $30,000, which was voted recently by the citizens to construct a water plant, a sewerage system, and to pay off some of the 6 per cent. floating debt with 4 per cent. bonds. The council immediately proceeded to pay the greater part of the money for the construction of a sewerage system, and pay off the floating debt, which action was resented by the water works people and resulted in their asking for the injunction, which has been granted.

Peoria, Ill.—Judge Grosscup has ordered an investigation of the water works matter. The court has control of the Peoria water works by virtue of foreclosure proceedings begun by the Atlanta Trust Company two years ago. The common complaint of the citizens of Peoria has been the inadequacy of the water works system, and recently an aplication has been made by a new water company, before the city council, for a franchise. It is the citizens opinion that considerations of a more sensible nature than public needs have been demanded and exacted by some of the alderman. Frank L. Wean has been designated as a special master in chancery, to investigate the charges against Receiver Gould and his alleged efforts to improperly influence the city council.

CONTEMPLATED WORK.

Millheim, Pa.—The organization of a water company is proposed.

Juniata, Pa.—Plans are being prepared for a water works system.

Ashland, O.—A new reservoir is needed for the water works plans.

Wilmington, N. C.—A filter plant may be erected by the water company.

Wells, Minn.—Plans for a water system are being made by C. F. Loweth of St. Paul.

Keokuk, Ia.—A water works plant of the same capacity as the present one is proposed.

Assumption, Ill.—An appropriation of $20,000 has been made for a water supply.

Hawkinsville, Ga.—Plans for the proposed water works are being prepared. S. A. Way, Mayor.

Niagara Falls, N. Y.—Plans are being made for a 6,000,000 gallon filter plant. H. A. Kellar, Supt.

Milford, Ill.—Bids will be invited soon for a water works system. Jacob A. Harmon, Engineer, Peoria.

Ashland, Wis.—A committee has been appointed to investigate the question of establishing water works.

Newton, Kas.—Plans and specifications have been received for the proposed extension of the water works system.

Argyle, N. Y.—The organization of a company to construct a water works plant is contemplated.

Gilman, Ill.—A. D. Thompson, C. E., Peoria, is preparing plans for a water works system for this town.

Greenwich, O.—Plans are being prepared for a water works system by B. J. Ashley of Chicago, Ill.

Merrimac, Mass.—Nothing will be done regarding the proposed water works before March, 1897.

Martin, Tenn.—An engineer has not yet been engaged for the proposed water works system.

Hogansville, Ga.—A gravity system is proposed. No definite action has yet been taken.

Royal Center, Ind.—A water works system is contemplated. T. P. Sweet, George A. Rea, Solomon Covis, Committee.

Vicksburg, Mich.—Plans are being made for a water works system by Alvord & Shields of Chicago. F. A. Robinson, City Clerk.

Shelton, Ill.—Plans and specifications for a water works system are being prepare by Jacob A. Harmon, of Peoria.

Dechert, Tenn.—A water works system, to supply this town an Winchester, is contemplated. E. D. Sanford, interested.

Elmira, N. Y.—A water works system will be built at Elmira Heights at an estimated cost of $35,000. The contracts have not yet been let. William Weadon Cole has organized a company for that purpose.

The water works question will be voted on as follows: Listowel, Canada, Aug. 21; Elyria, O., Aug. 24; Trinidad, Col., Aug. 11; St. Augustine, Fla., Sept. 1; Braddock, Pa., Aug. 18.

Water works systems are contemplated at the following places: Elburn, Ill.; Warrentown, Ore.; Antioch, Ill.; Kinsman, O.; Driftwood, Pa.; Hatboro, Pa.; Littletown, Pa.; Aberdeen, Md.; Lakeland, Fla.; Geneva, Fla.; Aberdeen, Miss.; Bay St. Louis, Miss.; West Point, Miss.; Washington, La.; Tullahoma, Tenn.; Uniontown, Ky.; Greenup, Ill.; Tonica, Ill.; Bangor, Wis.; Manawa, Wis.; Bedford, Ia.; Sanborn, Ia.; Ilwaca, Wash.; Timber, Mont.; White Sulphur Springs, Mont.; Cotton Plant, Ark.; Deseronto, Ont.; Wellandport, Ont.

Waterloo, Ia.—Plans and specifications for a water works system are being made by Hiram Phillips, City Engineer, of St. Louis, Mo.

West Brownsville, Pa.—Plans for the proposed water works system are being made by George Jenkins of Monongahela.

Clayton, N. Y.—Plans for the proposed water works system are in the hands of the state board of health. H. W. Morse, Village Clerk.

Bolivar, N. Y.—A special election will probably be called to vote on the issue of $12,000 in bonds for a gravity system.

Clinton, N. J.—Press reports state that the common council will probably grant a franchise for water works. Chester Thomson, City Clerk.

The proposition to construct water works has been favorably voted on at the following places: Suison, Cal.; Lancaster, N. Y.; East Cleveland, O.; Richmond, Mo.

Medway, Mass.—A water works system will be constructed in this pace by the Medway Water Company. No plans have been decided upon yet.

Nazareth, Pa.—Important extensions are contemplated by the Nazareth Water Company. The town is negotiating for the purchase of the plant.

Blanchester, O.—G. L. McKibben, City Engineer, Van Wert, has been engaged to prepare plans and superintend the construction of the proposed water works system.

CONTRACTS TO BE LET.

Three Oaks, Mich.—Bids are asked until Aug. 7 for constructing water works. F. B. Hinchman, Clerk.

Opelousas, La.—Sealed proposals will be received until Aug. 20 for the construction of a water works plant. C. J. Thompson, Mayor.

Edwardsville, Ill.—Bids are invited until Aug. 4 for the construction of water works. F. W. Raeder, Engineer, St. Louis, Mo.

Missoula, Mont.—Bids will be received until Aug. 10 for furnishing the city with water for a period of ten or twenty years. W. Hughes, City Clerk.

Doon, Ia.—Sealed proposals will be received for the construction of a system of water works. Certified check, $500. A. N. Thompson, Town Clerk.

Lester Prairie, Minn.—Bids will be received until Aug. 11 for constructing a water works system. Check, $150. Allen Yount, village recorder.

Binghamton, N. Y.—Sealed proposals will be received until Aug. 10 for furnishing a 12,000,000 gallon pumping engine. John Anderson, Secretary Water Comrs.

Fosston, Minn.—Sealed proposals will be received until Aug. 6 for constructing a water works and electric light system. J. O. Brandt, Village Recorder.

Bangor, Me.—Sealed proposals will be received until Aug. 13 for erecting a metal standpipe of about 1,500,000 gallons capacity. Certified check, $500. Walter I. Brown, Clerk Water Board.

Walkerton, Ind.—The Walkerton Water Works Company is ready to receive bids for the erection of a tower, pumping station and for equipping a complete water works system. William Clem, Secretary.

Cleveland, O.—Sealed proposals will be received until Aug. 7 for furnishing two six-foot aqueduct gates; until Aug. 14 for a short aqueduct and other works at the Division street pumping station. D. E. Wright, Dir. Public Works.

CONTRACTS AWARDED.

Mabel, Minn.—John Degnan, Winona, was awarded the contract, June 30, for constructing water works for $4,271.

Soudertown, Pa.—The contract for the construction of water works has been awarded to B. H Coon, of Kingston, N. Y., for $9,917.25

Castle Rock, Oreg.—The contract for constructing water works has been awarded to H. Orchard & Company, of Kalama, Wash.

Gilbertsville, N. Y.—The contract for constructing water works was awarded to L. J. Richardson of Owego, N. Y., for $11,618.

Malvern, Pa.—The contract for constructing a system of water works has been awarded to W. S. Wagner, of Auburndale, Mass., for $5,528.

BRIDGES.

Walworth, N. Y.—An iron bridge will be built across the creek west of this town.

Clinton, Mo.—A combined railroad and wagon bridge will be constructed.

South Paris, Me.—Plans have been reported for a new bridge at this place.

Central Bridge, N. Y.—A bridge 280 feet long, estimated to cost $10,000, is contemplated.

Willow Springs, Ill.—A permanent swing bridge has been suggested to cross the channel.

Melrose, S. Dak.—A new iron bridge is proposed to be put up near August Fraiponts.

Torrington, Conn.—The construction of a bridge at a cost of about $5,000 is proposed at Main street.

Langdon, N. D.—Bids will be received until Aug. 10 for constructing a bridge across Moscow Lake. H. Allardt, County Clerk.

Redfield, S. D.—The Wrought Iron Bridge Company, Canton, O., has been awarded contracts for building two bridges.

Benton Harbor, Mich.—This city has voted $15,000 for a bridge across St. Joe river near Royalton.

Pittsburg, Pa.—Plans have been prepared for reconstructing the suspension bridge over the Monongahela river by John Brunner.

Woonsocket, R. I.—An appropriation of $22,000 has been made to construct a steel bridge across the Blackstone at River street.

St. Hilaire, Minn.—The Wrought Iron Bridge Company, Canton, O., was awarded the contract for constructing a steel bridge for $5,495.

New Rockford, N. D.—Bids will be received until Aug. 3 for constructing a bridge across the Cheyenne river northwest of Cheyenne.

Philadelphia, Pa.—A new bridge, the estimated cost of which is $550,000, will be built across Schuylkill river at Gray's ferry.

Lisbon, N. D.—Bids will be received until Aug. 18 for constructing a wagon bridge over the Cheyenne river at Owego. T. J. Harris, county auditor.

St. Clairsville, O.—The Wrought Iron Bridge Company, Canton, O., has been awarded the contract for two bridges on the Wegee creek.

Elreno, Okla.—Sealed proposals will be received until Aug. 15 for constructing an iron bridge. J. K. Stone, county clerk, Canadian county.

Ottawa, Ill.—The city council has instructed the city clerk to advertise for a new steel bridge to replace the Illinois river bridge.

Winona, Minn.—County commissioners Bambeneck and Page have decided to build an iron bridge to replace the one recently collapsed at Dakota.

Hartford, Conn.—Plans for a bridge crossing the Park river on Asylum avenue have been referred to the city surveyor to examine and report recommendations.

Buffalo, N. Y.—Bids are asked until Aug. 3 for constructing three iron bridges over Scajaquada creek. R. G. Parsons, Secretary Department of Public Works.

Crookston, Minn.—The Wrought Iron Bridge Company, Canton, O., secured the contract for a bridge over the Red Lake river at Mallory for $4,000.

Deer Park, N. Y.—The town board has authorized the highway commissioners to erect a new iron bridge over the Bashac Kill and Cuddebackville.

Roanoke Rapids, N. C.—The new bridge across the Roanoke river, which was washed away recently, will be replaced by an iron and steel bridge of the same size, but at a higher elevation. Address Roanoke Rapids Power Company.

Waukegan, Ill.—Bids will be received until Aug. 3 for a steel bridge to be constructed near Gurnee, Ill. Thomas Strang, Chairman, Wadsworth, Ill.

Gastonia, N. C.—The county commissioners have decided to build an iron bridge across the south fork of the Catawba river, near McAdensville, N. C.

Niagara Falls, N. Y.—The citizens have voted to build a bridge over the railway tracks at Pierce street at an estimated cost of $15,000. W. W. Read, City Clerk.

Goshen, Ind.—The common council committee will bring before the notice of the county commissioners the unsafe condition of two bridges near here, and will recommend new structures.

Tecumseh, Mich.—Proposals will be received for furnishing a new steel bridge and constructing two stone piers, or a stone arch bridge. W. J. Ingersoll, Clerk.

Little Rock, Ark.—Bids were received July 15 for building the free bridge from three companies, the bids ranging in price from $350,000 to $400,000. Action was deferred.

Cranston, R. I.—The contract for constructing a stone arch bridge over the Pocassett brook on Cranston street has been awarded to Kenneth Mackay of Cumberland and Herbert Harris of Lincoln.

Prophetstown, Ill.—A commission has been appointed to investigate the advisability of building a bridge over Coon creek at this place. A. R. Hendricks, chairman of commissioners, Morrison, Ill.

Shelton, Wash.—Sealed bids will be received until Aug. 6 for the construction of a bridge across the west branch of the Satsop river. Certified check $50. Thomas McLarty, County Auditor.

Belmond, Ia.—The contract for the construction of a steel bridge of two spans of 100 feet each across the Iowa river has been awarded to A. H. Austin for $6,469.

Atlanta, Ga.—Sealed proposals will be received until Aug. 17 for constructing a steel bridge and repairs to road at Port Hudson, La., National Cemetery. John L. Clem, Major Q. M.

Alma, Neb.—Sealed bids will be received until Aug. 24 for constructing an iron bridge across the Republican river at Horn's ford, about twenty-four miles east of Republican City. Sam L. Roberts, County Clerk.

Shelbourne Falls, Mass.—The contract for building four bridges on the line of the Shelbourne Falls and Colrain street railway, was awarded July 3 to the Norton Iron Company of East Everett for $7,300.

Sacramento, Cal.—A new two-span truss bridge has been recommended to replace the bridge known as McConnell's, which spans the old river channel on the Arno road. The condemned foot bridge over the Figuero street ravine in Folsom will probably be replaced by a wagon bridge.

Cleveland, O.—Sealed proposals will be received until Aug. 12 for constructing a timber Howe truss bridge over the tracks of the C. & P. and the L. S. & M. S. R. R. at Seneca street, from Seneca street extension to Lake Erie. Certified check, $500. D. E. Wright, Dir. P. W.

Shelton, Wash.—Bids will be received until Aug. 6 for constructing a bridge over the west branch of the Satsop river. Thomas McCarthy, County Auditor.

Sprucehead, Me.—The Wrought Iron Bridge Company, Canton, O., has been awarded the contract for constructing a new steel bridge of six spans, each 52 feet long with a 14-foot roadway and a capacity of eight tons, with a safety factor of four. The total cost of the bridge will be $42,000.

PARKS.

Nashville, Tenn.—Cumberland Park will be improved.

Waynesburg, Pa.—The Park Commissioners have decided to make a boulevard around the parks.

Ackley, Ia.—A fund is being raised for the purpose of establishing a boulevard on some street in this city.

Santa Barbara, Cal.—The citizens have appealed to the government for two sections of wild mountain land for a national park.

Newark, N. J.—The West End Improvement Association urges the establishment of a park in the western part of the city.

Cleveland, O.—John D. Rockefeller has given the city land for park purposes and the sum of $330,000 to be expended in improving this land, making a total of $600,000.

Kansas City, Mo.—A scheme for a hospital park is proposed by Dr. Coffin, who proposes to make a park of the Hospital grounds for invalids and convalescents.

Pensacola, Fla.—An ordinance has been introduced in the city council to authorize the Board of Public Works to establish a new park on Palafox street, between Garlin and Wright streets.

Kansas City, Kas.—The new park and boulevard commission appointed by Mayor Twiss will map out a system of parks and boulevards under the laws governing the subject. O. M. Wilson, Chairman of Committee.

Quincy, Ill.—The city council has voted to accept Primrose and South Park additions, nearly 20 acres of public park land in the north end and nearly five acres at the entrance to South Park.

Decatur, Ill.—The park commissioners have under consideration an elaborate plan for the improvement of West Eldorado street for a distance of half a mile, which contemplates widening it to 100 feet and macadamizing it.

Tampa, Fla.—A boulevard from this city to Old Tampa Bay, which would be an extension of Grand Central avenue, is contemplated. This would give a road four miles long. Chairman Drawdy of the board of county commissioners is interested.

Centralia, Wis.—The question of establishing a city park is being considered. A park commission has been apointed, consisting of Alderman F. H. Jackson and Ira Bassett and Messrs. T J. Cooper, Theron Lyon and J. D. Witter to gather information touching on the subject.

TOO LATE FOR CLASSIFICATION.

New York, N. Y.—The lowest bid presented July 17 for about 6,000 square yards of paving was that of the Barber Asphalt Paving Company.

Bucyrus, O.—Bids will be received until Aug. 6 for the construction of two sewers. Guarantee, $1,000 each. W. A. Blicke, City Clerk.

Joliet, Ill.—Sealed bids will be received until Aug. 3 for curbing, grading and macadamizing Richard street. Certified check, $200. Sam C. Rickson, City Clerk.

Jersey City, N. J.—The Barber Asphalt Paving Company was the lowest bidder, July 20, for paving Danforth street, between Ocean and Garfield streets, 3,750 square yards.

Terre Haute, Ind.—Sealed proposals will be received until Aug. 18 for paving the alley between Cherry street and Wabash avenue with brick on concrete foundation. Charles H. Goodwin, City Clerk.

Troy, O.—Sealed proposals will be received until Aug. 21 for the erection of a swing or hoist bridge over the Miami and Erie canal at Plum street. Deposit, $100. E. E. Pearson, County Auditor.

Reading, Pa.—At a special meeting of select council July 22 the ordinance recommended by the board of public works adopting sheet asphalt as the paving material for Penn street was rejected, and an amendment substituting brick was passed.

Newark, N. J.—Paving contracts were awarded July 9 as follows: Elizabeth avenue, asphalt, J. F. Shanley, $2.47 a square yard; Halsey street, from Bank to Campfield, asphalt, Newark Paving Company, $2.59 a square yard; grading and curbing Jeliff avenue, James Seamy, $566.10.

Detroit, Mich.—Bids were received July 24 for widening and paving Concord avenue and for paving State street between Rowland and Cass. The lowest bid for Concord avenue, which will be cedar block on concrete, was presented by J. H. Talbot, $2,585.13. The Barber Asphalt Paving Company's bid for asphalt paving on State street was the lowest, $6,333.59, and that of John McLoughlin for brick, $4,353.91, was the lowest.

Brooklyn, N. Y.—Bids were received July 20 for fifteen sections of asphalt paving in different parts of this city. The work involves the laying of 54,959 square yards of asphalt, at an estimated cost of $127,956.22. While the bidding on the streets is very close, the prices are higher and varied, according to streets, more than usual. The lowest bidders are as follows: Fruin-Bambrick Company—Heywood street, $11,294.06; Keep street, $22,219.90. Brooklyn Alcatraz Company—Madison street, $4,403.70; South Elliott Place, $6,167.20; Green avenue, $5,120 and $7,689.71; Court street, $6,235.22. Joralemon, $3,605.65; St. James Place, $5,726.20. Cranford & Co.—Macon street, $7,794; Fourteenth street, $17,114.10; Gates avenue, $10,685.20; Macon street, $7,100.30. Eastern Bermudez Company—Cooper street, $5,562.70; Delmonico Place, $7,245.24.

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MAKES PERFECT STREET CLEANING POSSIBLE. THE EASIEST AND CHEAPEST TO CLEAN.

The handsomest and cleanest streets are those paved with Trinidad Lake Asphalt.

The problem of street cleaning is one which perplexes all cities. It requires constant supervision, work and expense. A moment's reflection shows why an asphalt pavement facilitates street cleaning. The Trinidad Lake Asphalt pavements, on hundreds of streets in scores of cities, reduce the labor and expense of this important branch of the sanitary work of a city to a minimum.

An investigation of the excellent work of the street cleaning departments of New York, Washington, Paris, Berlin, and other cities of importance, shows that the cost is reduced from one-fourth to one-half upon streets paved with reliable asphalt.